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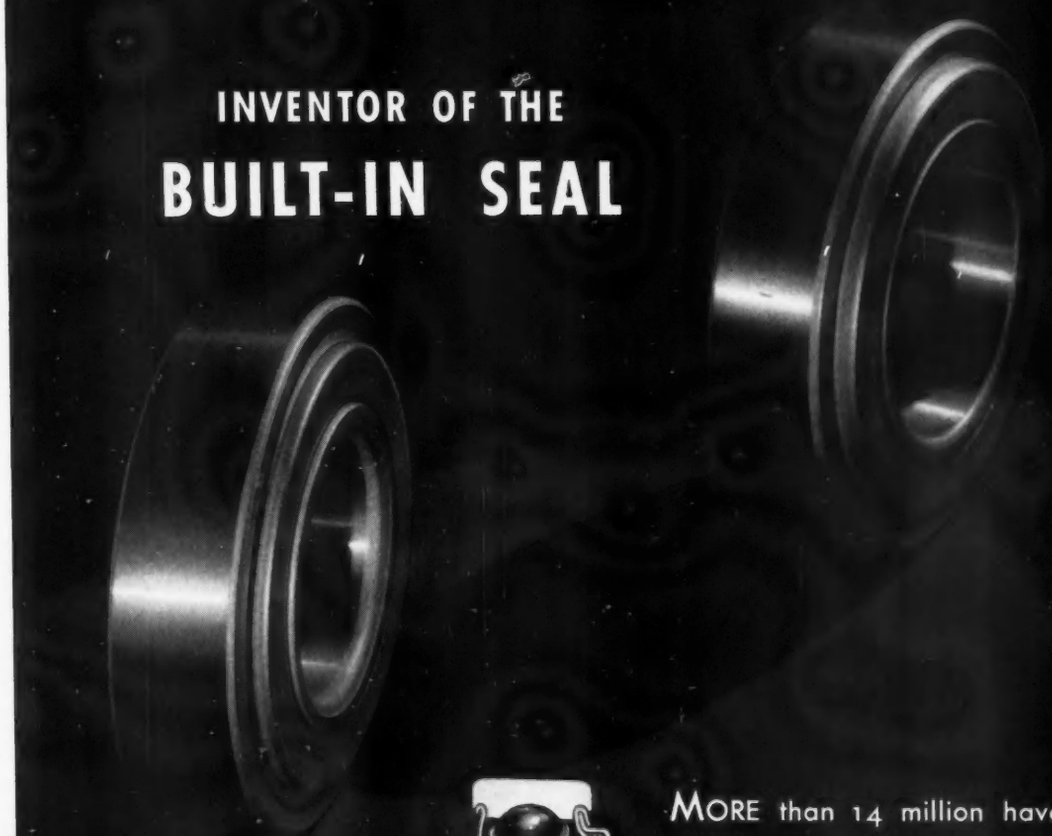

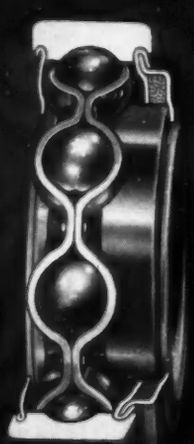

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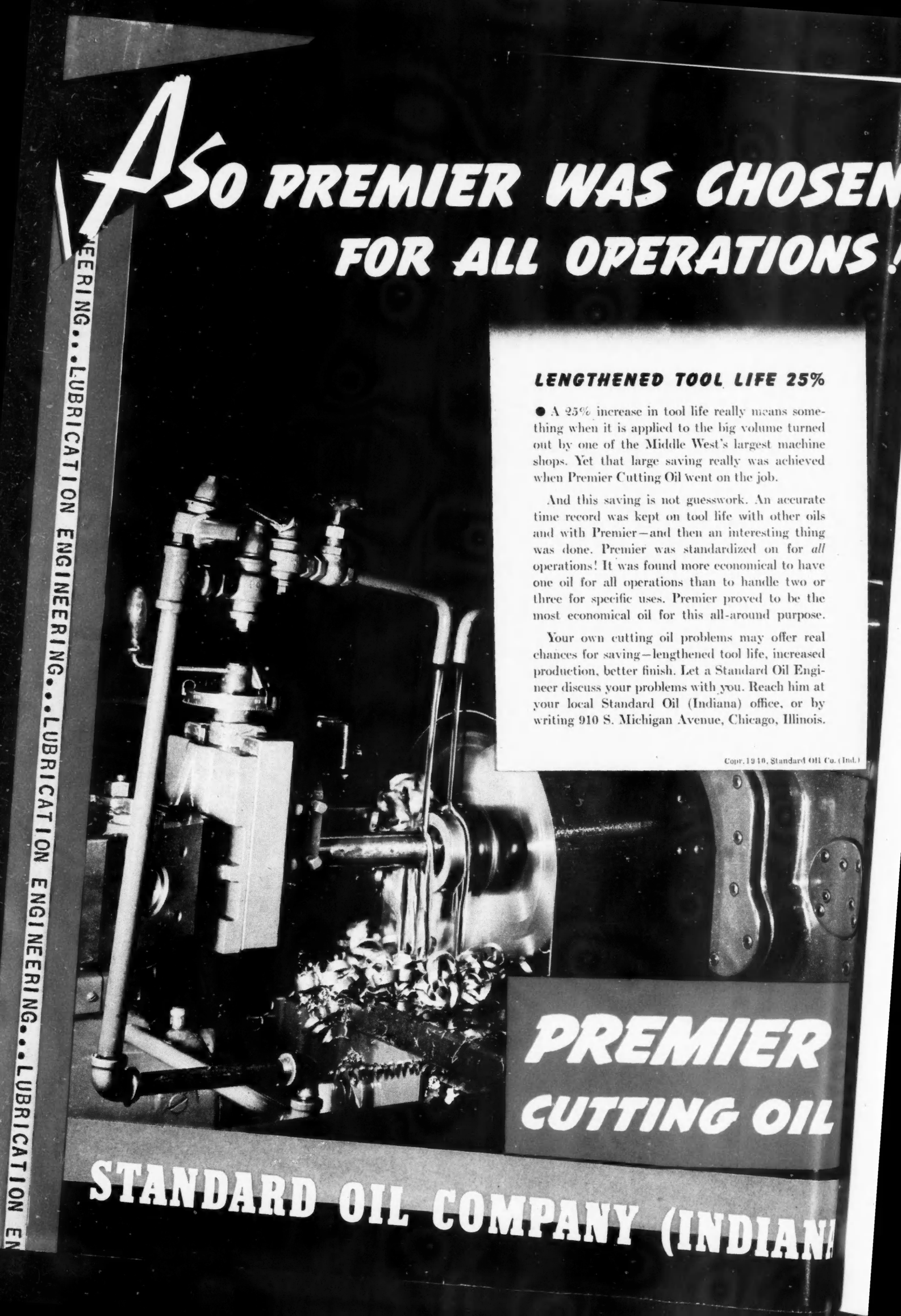

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Reg. U. S. Pat. Off.
Published Semi-Monthly

Volume 82 Number 11

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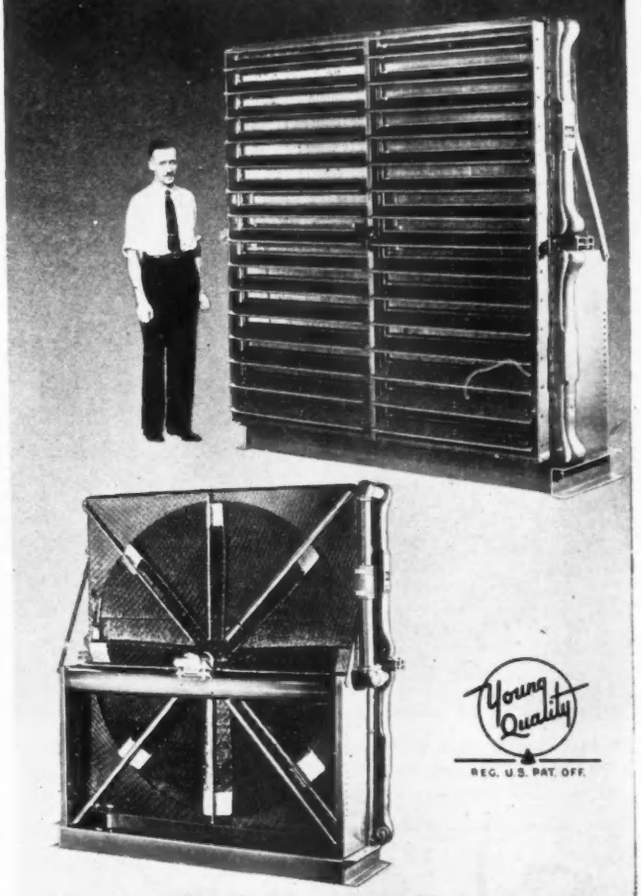

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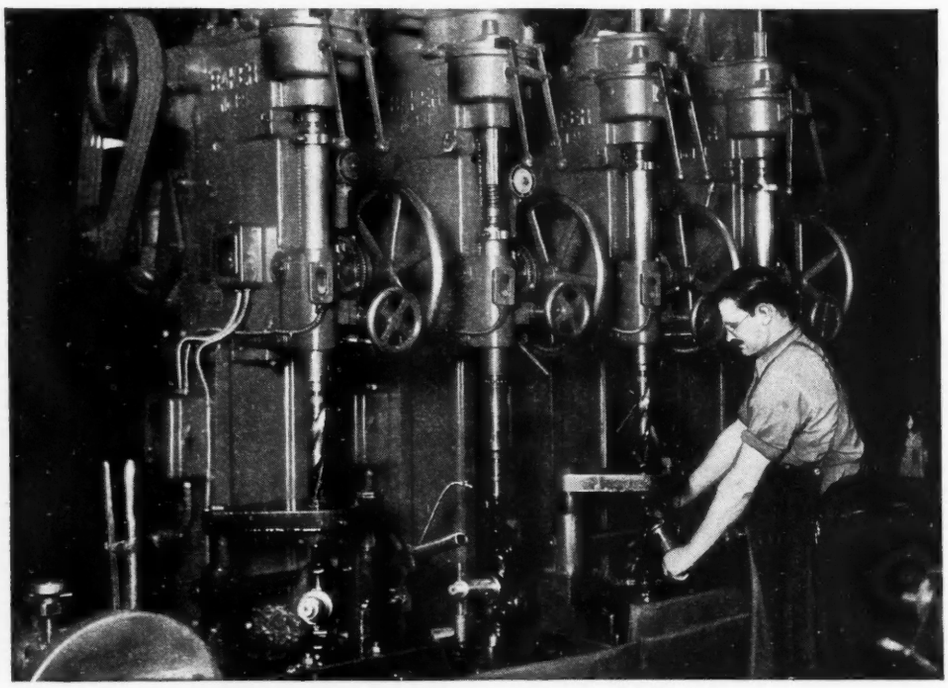
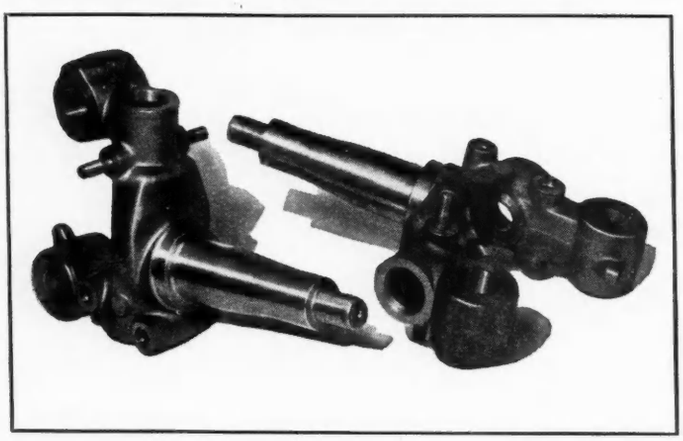
Drill Life Increased . . .



From 15 to 70 Pieces

4-SPINDLE BAKER DRILL PRESS set up for drilling the steering knuckles shown below. Changing to *Texaco Sultex Cutting Oil,* output per drill-grind increased from 15 to 70 pieces.



THE STEERING KNUCKLES above are forgings of SAE 4130 steel, heat treated 241, Brinelling 285. 366% increase in output resulted from changing to *Texaco Sultex Cutting Oil B.*

MACHINING these steering knuckles in 4-spindle Baker Drill Presses, the best production between drill-grinds was 15 pieces.

Then . . . by the simple change-over, from one brand of cutting oil to another . . . the output per drill-grind quickly went up to 70.

The cutting oil that brought this 366% increase is *TEXACO SULTEX CUTTING OIL B.*

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TEXACO SULTEX

CUTTING AND SOLUBLE OILS

IN THIS ISSUE . . . .

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

Volume 82 June 1, 1940 Number 11

RESULTS obtained in the Italian One Thousand Mile road race for semi-stock sports cars are important. The winning B.M.W. sedan, with a non-supercharged engine of 122 cu. in., averaged 103.9 m.p.h. for nearly one thousand miles, put up a lap record (100 mi.) at 108 m.p.h., and over the flying kilometre attained a speed of 134 m.p.h.

The Alfa Romeo which finished second was only slightly slower and its maximum over the flying kilometre was 120.2 m.p.h. A Fiat of only 34 cu. in. made a lap record at 75 m.p.h; a 67 cu. in. Fiat established the lap record at 86.4 m.p.h. and a 91 cu. in. Ferrari accomplished the 100 mile course at 90.7 m.p.h.

The cars had to be in regular production and many of them started in the race with closed streamlined bodies. The winning B.M.W. had a six-cylinder engine of 66 by 96 mm. bore and stroke with two overhead camshafts, a compression ratio of 8-1, from which 125 h.p. were obtained at nearly 6000 revolutions. The engine was fitted with three downdraft Stromberg carburetors. Weight of the car was reduced to 1433 lb. by an extensive use of light alloy. The chassis was of light alloy, but the nature of the metal could not be ascertained. Disc wheels were also light alloy.

The sedan four passenger body weighed only 94 lb. Streamlining was carefully carried out. Door handles and hinges, hood hinges and catches were all invisible; license plates were recessed.

The B.M.W. success is attributable very largely to the favorable power-weight ratio. Alfa Romeo, with six-cylinder, 152 cu. in. engines, having two overhead camshafts and three carburetors and an 8 to 1 compression ratio, obtained 128 h.p. at 4800 revolutions. Their total weight, however, was 2494 lb., and this is the explanation of the difference of speed between the German and the Italian cars.

Delage came with two 183 cu. in. push rod engines from which he obtained 135 h.p. at 5000 revolutions. Total weight was 2240 lb. These cars probably were faster than the Germans, but

(Turn to page 537, please)

RACE

Page

Behind the Checkered Flag **393**

There are forty-seven of the world's fastest automobiles aspiring to the honor of winning the annual classic at Indianapolis. They have new features that engineers have been working out for the last twelve months. This on the scene story and description of the entrants makes informative and interesting reading.

PRODUCTION

Piston Production at Pontiac **506**

In this, the forty-ninth monthly production story presented to the readers of AUTOMOTIVE INDUSTRIES, several new features of manufacture are described. While possibly they are unique to piston production the ideas behind them are applicable to the production lines of other parts.

A Unit a Second at King-Seeley **510**

The story connected with the development and growth of a pioneer in the manufacture of electrically operated panel instruments for automobiles is told here. With very modest beginnings that have developed to make the front lines in the industry this account becomes a "must read."

Men and Machines **516**

Engineering Drawings **521**

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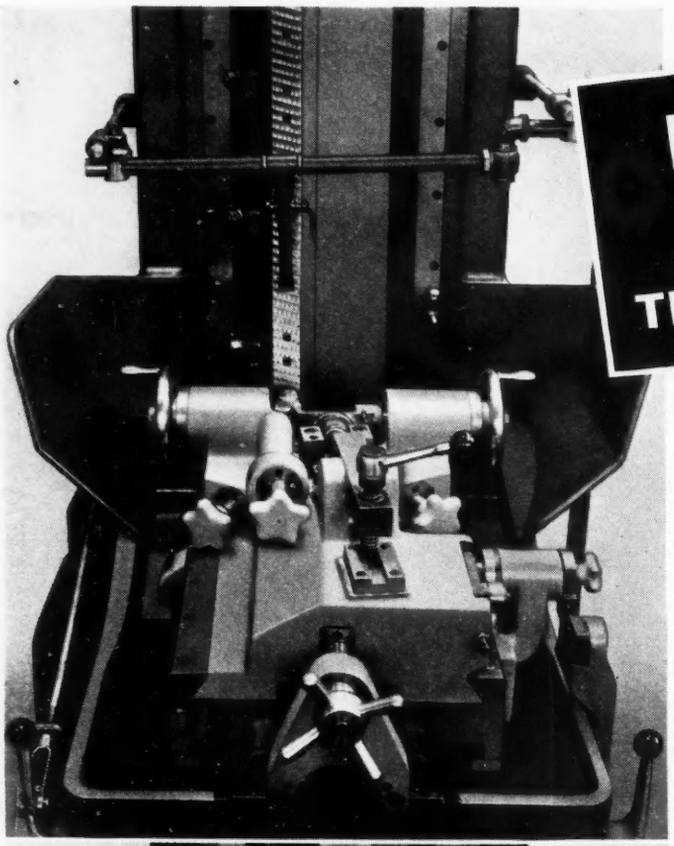
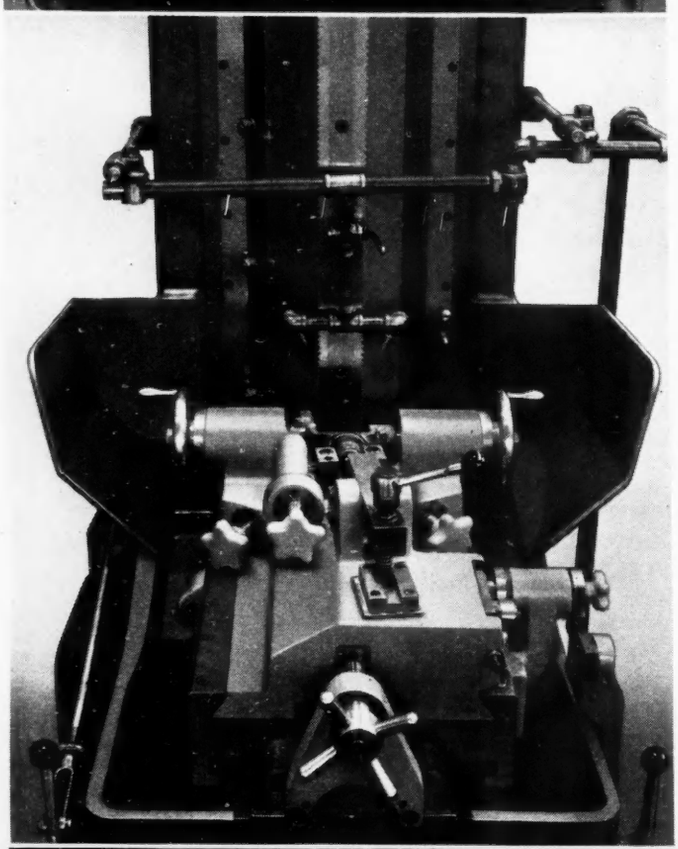
Since 1913 all issues of AUTOMOTIVE INDUSTRIES have been indexed in the *Industrial Arts Index*, which can be consulted in any public library.





IT'S A CINCH TO CHANGE THESE BROACH SET-UPS

SURFACE broaching can now be applied to relatively small quantities of parts. It's done every day on CINCINNATI Vertical Hydro-Broach Machines, chiefly because they have an exclusive interchangeable broach holder construction that minimizes set-up time.

For example, the above illustrations show two different set-ups on one CINCINNATI No. 10-66 Single Ram Vertical Hydro-Broach Machine. Three fixtures were designed to hold five different steering knuckles. Four broach holders complete the equipment.

Each of the five parts requires two operations and some of them require three cuts to complete an operation. Change-over or resetting may be accomplished by merely loosening the clamps at the side of the broach holder, changing the holder, and resetting the fixture.

Set-ups may be changed in less than an hour, and production varies from 45 to 96 parts an hour, depending upon the part and the number of cuts.

Perhaps many parts in your own shop can be broached more economically on CINCINNATI broaching equipment. Why not start your survey by writing for catalog M-886.

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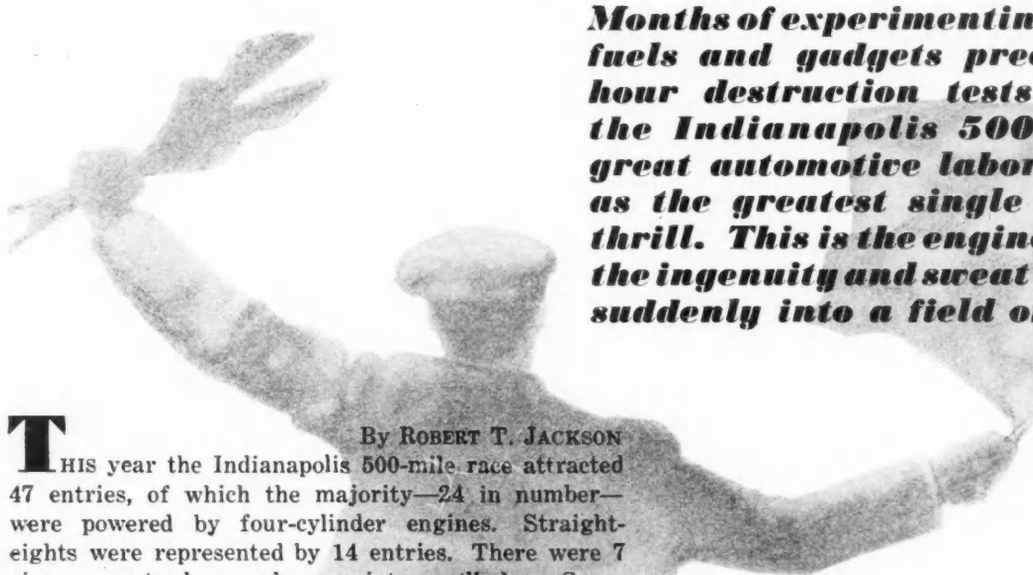
AUTOMOTIVE INDUSTRIES

Published on the 1st and 15th of the month

Vol. 82, No. 11
June 1, 1940

Behind the Checkered Flag . .

Months of experimenting with metals, fuels and gadgets precede the five-hour destruction tests which make the Indianapolis 500-mile race a great automotive laboratory as well as the greatest single public sports thrill. This is the engineering story of the ingenuity and sweat which blossom suddenly into a field of roaring cars



By Robert T. Jackson

THIS year the Indianapolis 500-mile race attracted 47 entries, of which the majority—24 in number—were powered by four-cylinder engines. Straight-eights were represented by 14 entries. There were 7 sixes, one twelve, and one sixteen-cylinder. Seven Italian cars entered, four Maseratis and three Alfa-Romeos.

From the designers' standpoint, this year's race found more capable and interesting constructions present than ever before. For the most part, attention of technical observers concentrated on the foreign cars, owing to the 1939 victory of the type 8CTF Maserati driven by Wilbur Shaw as a Boyle Special.

The 1940 entry list shows 3 type 8CTF Maseratis and one type 8CL 3000, the latter a much improved and more powerful version of the 8CTF. As a matter of fact, the four Maseratis represent the entire output of cars built by that firm under the current International Formula.

One of the three Alfa-Romeos entered is a design produced for the present formula, while the other two are earlier models, one of which antedates the adoption of independent suspension by Alfa-Romeo in 1936. All three Alfas carry 3 liter supercharged engines.

Without a doubt the most powerful engine ever to appear at Indianapolis since the current formula was adopted in 1938 is the 8CL 3000 Maserati of Raul Riganti. But the Bowes Seal Fast entry of Rex Mays has a power output which compares very favorably with the foreign product. The Sampson entry, utilizing a redesign of the original Lockhart beach record 16-cylinder powerplant, should rate parity with the Bowes engine.

The balance of the American cars and engines represented in the 1940 race is a very capable group, even though most of them are four-cylinder unsupercharged powerplants, which naturally have a slightly more conservative performance than the blown multi-cylinder designs.

In describing the construction of some of the foreign engines it is desirable to refer to the drawings shown on pages 498 and 499, covering the Maserati 8CTF engine. The use of Rootes compressors is typical of most foreign practice. They are usually driven directly, at engine speeds. Maserati employs two separate units, while Alfa has a pair of compressors built into a single component, driven from the gear train located in the center of the engine. This is shown in the photograph of the engine in the Wharton-Dewart entry (page 495).

Boost pressures of the foreign engines vary with the make and model, but those which competed at Indianapolis averaged a boost of about 15 to 18 or 20 pounds. It is customary to employ a carburetor for each compressor. Alcohol fuels are naturally taken for granted with this sort of set-up, owing to the high latent heat of evaporation possessed by most alcohols, particularly methyl and ethyl. The alcohol base fuels increase volumetric efficiency materially, resulting in high outputs for given displacements, but they have the disadvantage of high specific consumption figures.

American designers have produced engines which operate very well indeed on gasoline fuels. The Bowes entry previously mentioned burns 100-octane aviation fuel. Even more remarkable is the design worked out

for the Harry A. Miller six-cylinder engines used in the four-wheel drive cars of the same name, entered by Eddie Offutt. These engines are operated on commercial ethyl gasoline, in this case the standard Gulf product, No-Nox Ethyl, which has an octane number of approximately 80. The output of these particular engines approaches 300 horsepower at 7000 r.p.m. This figure is given as the output after a run of some minutes, not a peak run-up.

Unique on these Harry A. Miller cars are many features. Because of a series of misfortunes, they did not compete in the race. Nevertheless, their construction affords a number of fine examples of ingenious and compact design. Among these are the double-entry supercharger shown in illustrations on page 501, the engine structure of remarkable simplicity and compactness, shown in photograph on page 501, and the four-wheel drive mechanism itself, which has been restricted to very minimum space and dimensions. The assembly drawings appearing on page 500 illustrate the proportions of the various driving units.

The four-wheel drive principle itself appears to be a somewhat controversial element of design, and many authorities hold that it is unsuitable for speedway and road racing work. Among the critics who have presented much rational and conclusive evidence against the four-wheel drive is R. Reid Railton*, the British engineer and racing designer who carried out the design of the car which at present holds the world's automobile speed record.

The case against four-wheel drive may or may not be strengthened by the experience of the Harry A. Miller cars at Indianapolis. It is quite evident that considerable research and experimentation will be required to produce a four-wheel drive racing car which will be completely manageable under all conditions. By the time this goal has been achieved the apparent advantages of four-wheel drive may be minimized by the factors which must be introduced to provide absolute directional control in turns at high speed.

* See AUTOMOTIVE INDUSTRIES, May 29, 1937.

Indianapolis Entrants

Car No.	Name	Driver	Engine Make	No. Cylinders	Bore	Stroke	Displacement	Supercharged	Type S'rcharger	Spark Plugs	Ignition	Ignition Cable	Piston Rings	Carb. No.	Carb. Make	Carb. Car Drive	Suspension Front	Suspension Rear	Brakes	Shock Absorbers Front	Shock Absorbers Rear	Starter	Fuel	Oil	Weight	Rear Axle Gears	Qualifying Speed	Car No.
1	Boyle	Shaw	Mas	8	2.719	4.000	178.1	Y	2R	C	V	P	C	2	Me	R	I	E	H	Ma	H	H	B	ZCa	1937	M	127.065	1
3	Boyle	Horn	M	8	3.375	3.750	268.0	N	..	C	B	P	C	4	M	F	C	C	M	H	H	D	G	ZC	1950	D	125.545	3
4	Wheeler	Stapp	M	8	2.265	3.000	96.0	Y	1C	C	B	P	C	1	W	R	C	C	M	G	G	B	G	G	1448	D		4
5	Noc-Out-Hose Cl.	Bergere	O	4	4.327	4.625	270.0	N	..	C	B	P	B	2	W	R	C	C	H	H	Hf	B	S	Mc	1936	D	123.673	5
6	Hollywood Pay Day	Barringer	O	4	4.250	4.500	255.0	N	..	C	B	P	C	..	..	R	C	C	M	H	H	B	G	G	1826	D	.....	6
7		Rose	O	4	4.312	4.625	270.0	N	..	C	B	P	B	2	W	R	C	C	H	H	Hf	B	S	ZC	1900	D	125.624	7
8	Thorne-Donnelly	Thorne	S	6	3.531	4.625	271.0	N	..	C	B	P	C	6	W	R	C	C	H	H	Hf	A	B	ZC	1974	D	122.432	8
9	Boyle	Wearne	O	4	4.265	4.500	257.0	N	..	C	B	P	C	2	W	R	C	C	H	H	H	B	G	ZC	1795	D	123.216	9
10		Connors	L	6	3.750	4.000	265.0	N	..	..	B	P	B	4	Wh	R	C	C	DH	H	H	D	O	G	1905	D	.....	10
12	Schoof	Durant	O	4	4.250	4.500	255.0	N	..	C	B	P	C	2	W	R	C	C	H	H	H	B	S	Ca	1784	D	.....	12
16		Brisko	B	6	3.625	4.375	271.0	N	..	C	B	P	B	3	W	F	C	C	M	H	H	D	G	G	1963	D	122.716	16
19		Snowberger	M	4	4.250	4.500	255.0	N	..	C	B	P	B	2	W	F	C	C	M	H	H	D	G	Z	1879	D	121.564	19
21	Marks Offenhauser	Nalon	O	4	4.312	4.625	270.0	N	..	C	B	P	C	2	M	R	C	C	H	H	H	B	..	Ca	1812	D	.....	21
24	Sorber	Cantlon	O	4	4.320	4.500	262.0	N	..	C	B	P	B	2	M	R	C	C	H	H	H	B	..	..	1837	D	123.367	24
25	Belanger-Foltz	Andres	O	4	4.260	4.500	257.0	N	..	C	B	P	C	2	W	R	C	C	..	H	H	B	..	..	1800	D	.....	25
26	Walsh Offenhauser		O	4	4.312	4.625	270.0	N	..	C	B	P	B	2	W	R	I	C	H	H	H	B	G	G	2080	D	.....	26
27	Marks	Hinnershitz	O	4	4.312	4.625	270.0	N	..	C	B	P	C	2	W	R	C	C	HM	H	H	B	X	Ca	1886	D	122.624	27
28		Hanks	D	4	3.812	4.000	182.8	Y	1R	C	B	P	..	1	W	R	C	C	H	H	H	..	..	..	..	D	.....	28
29	Maserati	Rigarti		8	3.060	3.060	180.0	Y	2R	M	V	..	M	2	Me	R	C	C	M	Ma	Ma	H	..	..	..	M	.....	29
30	Hartz	Hanson	MH	8	2.825	3.500	182.0	Y	1C	C	B	P	C	1	S	F	C	C	M	H	H	H	G	Z	1901	D	124.753	30
32	Sampson	Swanson	Sa	16	2.187	3.000	183.0	Y	2C	C	B	P	A	2	W	R	C	D	H	H	H	H	..	Z	2216	D	.....	32
33	Bowes Sealfast	Mays	B*	8	2.968	3.250	180.0	Y	1C	B	B	P	C	2	W	R	C	C	H	H	H	H	S	Mc	2110	D	127.850	33
34	Alfa-Romeo	Miller	AR	8	2.717	3.937	182.6	Y	2R	C	B	P	B	2	We	R	I	I	H	F	H	H	TB	T	1902	..	.....	34
35	Indiana Fur	Petillo	O	4	4.312	4.625	270.0	N	..	C	B	P	..	2	W	R	C	C	H	H	H	B	..	..	1951	D	.....	35
36		Williams	M	4	4.250	4.500	255.0	N	..	C	B	P	C	2	W	F	C	C	M	Hf	H	D	C	Z	..	D	.....	36
37	Kimmel		V	12	2.750	3.700	267.0	N	..	C	B	P	C	4	Z	R	C	C	H	H	H	B	G	G	..	..	.....	37
38	Elgin Piston Pin	Russo	B	6	3.625	4.375	271.0	N	..	C	B	P	B	3	W	R	C	C	M	H	H	D	..	..	..	..	.....	38
39	Cheesman-Maserati	Banks																									.....	39
41	Hollywood Pay-Day	Mc Quinn	AR	8	3.000	3.200	180.86	Y	2R	C	B	P	C	2	We	R	I	C	HM	F	Hy	H	A	G	1906	..	.....	41
42			O	4				N	..	C	B	P	C	2	W	R	C	C	H	H	Hf	B	G	G	1791	..	.....	42
43	Holabird Red Cedar	Unser	O	4	4.250	4.500	255.0	N	..	C	B	P	C	2	W	R	C	C	H	H	H	B	G	G	..	D	.....	43
44	Refinoil Motor Oil		O	4	.....	.....	.....	N	..	C	B	P	C	2	W	R	C	C	H	H	H	B	..	R	1934	D	.....	44
45	Leader Card	Willman	MM	8	.....	.....	.....	Y	1C	C	B	P	C	1	W	R	C	C	H	H	H	B	..	Ca	1884	D	.....	45
46	Phillips	Phillips	..	..	.....	.....	.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.....	46
47		Hall	..	..	.....	.....	.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.....	47
48	Lucy O'Reilly Schell	Dreyfus	..	8	2.719	4.000	178.1	Y	2R	C	V	P	C	2	Me	R	I	E	H	Ma	H	H	B	ZCa	1937	M	.....	48
49	Lucy O'Reilly Schell	Le Begue	..	8	2.719	4.000	178.1	Y	2R	C	V	P	C	2	Me	R	I	E	H	Ma	H	H	B	ZCa	1937	M	.....	49
51			W	4	3.687	4.250	181.5	Y	1R	C	B	P	C	..	..	R	C	C	M	H	H	B	G	G	..	..	.....	51
53	Keller	Martinson						N	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.....	53
55			Bu	8	3.250	3.875	257.0	N	..	C	S	P	C	4	W	R	C	C	H	H	H	D	G	G	1763	..	.....	55
58	Alfa-Romeo		AR	8	2.677	3.937	178.0	Y	2R	C	S	P	C	2	We	R	C	C	M	H	H	H	G	G	..	..	.....	58
59	Walt Woestman		..	..	.....	.....	.....	..	..	..	B	P	B	2	W	R	C	C	HM	H	H	B	G	G	..	..	.....	59

ABBREVIATIONS:

Engine Make
Mas—Maserati
M—Miller
O—Offenhauser
S—Sparks
L—Lencki
B—Brisko
D—Duray
MH—Miller-Hartz
Sa—Sampson
B*—Bowes Seal Fast
AR—Alfa Romeo
V—Voelker
MM—Marchese Miller
W—Wehr
Bu—Buick

Supercharged
Y—Yes
N—No
R—Rootes
C—Centrifugal

Spark Plug
C—Champion
M—Maserati
B—Bowes

Ignition
V—Scintilla Vertex
B—Bosch
S—Scintilla

Ignition Cable
P—Packard

Piston Rings
C—Perfect Circle
B—Burd
M—Maserati
A—American Hammered

Carburetor Make
Me—Menini
M—Miller
W—Winfield
Wh—Winfield Horizonta
S—Stromberg-Dual
We—Weber
Z—Zenith

Drive
R—Rear
F—Front

Suspension
I—Independent
C—Conventiona
E—¼ Elliptical
D—DeDion

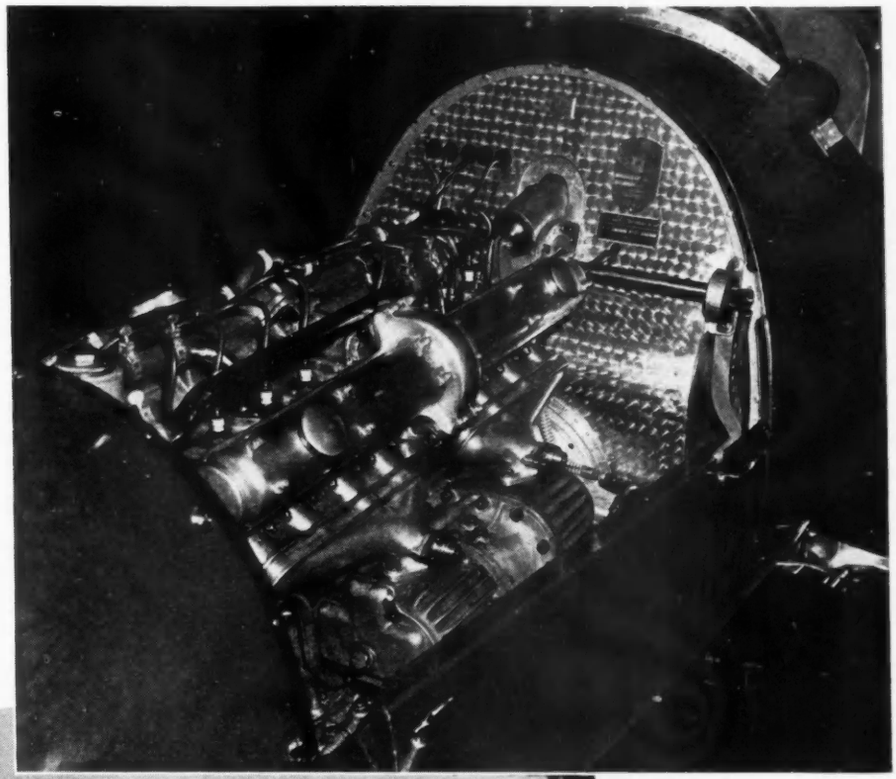
Brakes
H—Hydraulic
M—Mechanical
D—Disk

Shock Absorber
H—Houdaille
Hf—Hartford
Ma—Maserati
G—Gabriel
F—Friction
Hy—Hydraulic

Starter
H—Handcrank
D—Delco
B—Bosch
A—Compressed Air

Fuel and Oil
B—Alcohol Blend
G—Gulf
S—Shell
O—Own Mixture
X—D-X Motor Fuel
TB—Texaco Blend
C—Crystal Flash
ZCa—Oilzum Castor
ZC—Oilzum Crystal
Mc—McMillan Ring-Free
Ca—Castor
Z—Oilzum
T—Texaco
A—Alcohol
R—Refinoil

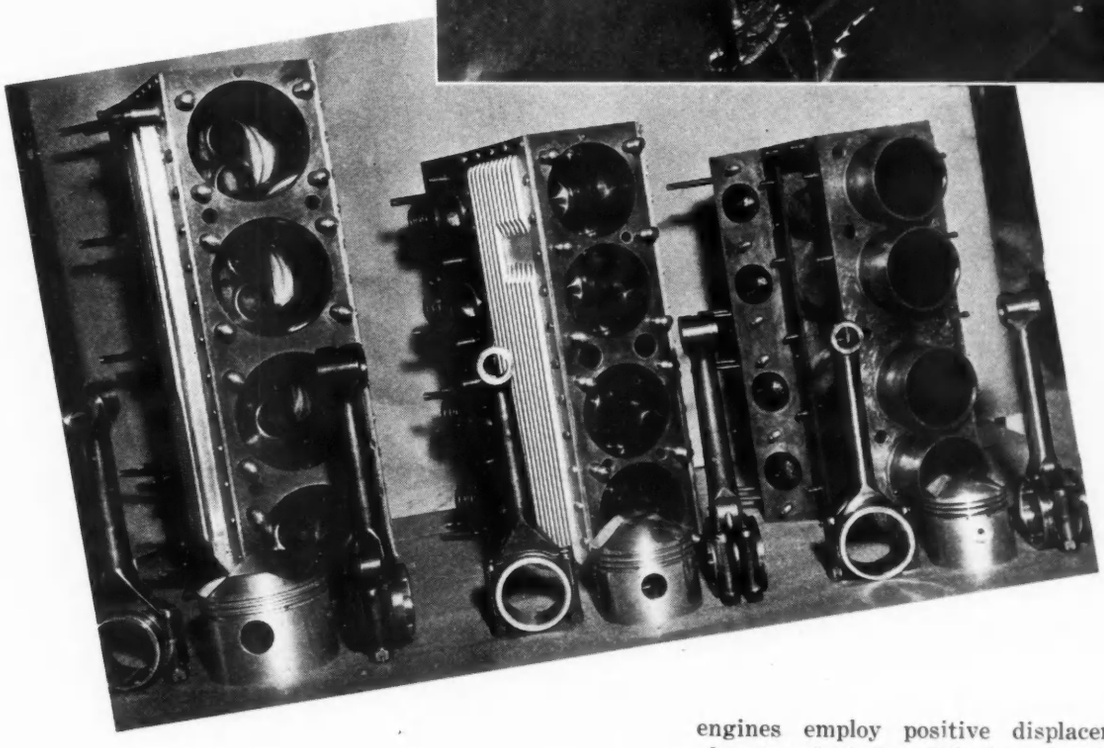
Rear Axle Gears
M—Maserati
D—Double Diamond



(Right) View showing engine of the Alfa-Romeo entered by Wharton-Dewart Motor Racing, Inc., and driven by Chet Miller.

(Below) Comparative Anatomy: Left, parts of four cylinder 255 cubic inch Offenhauser engine; center, one block, rods and piston of 268 inch 8 cylinder Miller engine used in Ted Horn's car; right, corresponding group of Maserati parts from Wilbur Shaw's engine.

Photos by Robert T. Jackson



Inasmuch as remaining American racing designs are more conventional than the Harry A. Miller four-wheel drive cars, the withdrawal of the latter from competition is regretable, although not entirely surprising. Presumably, the influence of these cars on future racing designs will be more in the direction of stimulating ingenious and thorough design work rather than in advancing the four-wheel drive principle.

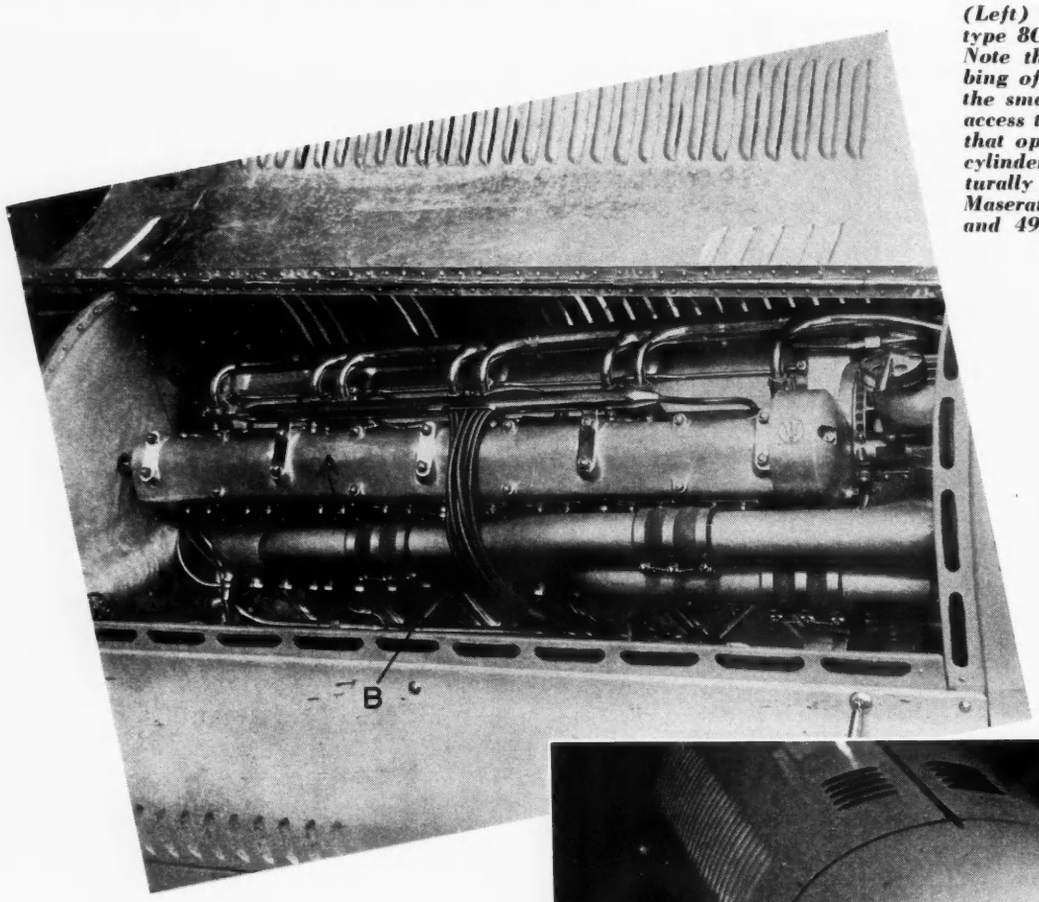
Returning to the foreign type of construction, it may be helpful to contrast some of this practice with that of our own designers. For example, the foreign engines employ positive displacement compressors almost exclusively, while American blowers are usually of the rotary, or centrifugal type. Use of the former virtually dictates an alcohol fuel, while the rotary compressor offers its champions the choice of either gasoline or alcohol.

Aside from the matter of fuel, the rotary compressor appears to have other advantages for use on the Indianapolis speedway. Racing at the Hoosier course is an art in itself, very little like the road racing for which the foreign cars are intended and where the positive displacement compressor is most valuable. This is because the course at Indianapolis can be run at very high speeds, turns included, and the engine speeds per lap seldom vary more than 1000 to 1500 r.p.m.

Under these conditions the rotary compressor is at its best, and without a doubt produces much more favorable acceleration characteristics than the positive displacement type, especially the Rootes variety. The latter, after reaching the peak of its delivery curve, which is practically an angular line rising sharply at moderate speeds, offers no appreciable increase in boost. Indeed, its efficiency falls off somewhat if turned too fast, and acceleration suffers. Also, the positive displacement type requires a very careful study of port and manifold proportions if most favorable results are desired.

On the other hand, the rotary compressor maintains an increasing boost pressure from almost any engine speed approximating 60 to 80 percent of the maximum for a given engine. This accounts for the better acceleration obtained with the centrifugal blower under Indianapolis conditions. However, the rotary compressor set-up requires much more care in engineering than the Rootes type. This is because the rotary impeller, turning at fairly high speeds, induces high inertia loadings in driving and rotating parts. Ratios employed between impeller and engine vary a little but approximate 4½ or 5 to 1. For example, the impeller on the six-cylinder Harry A. Miller engine turns about 32,000 r.p.m. at 7000 r.p.m. of the crankshaft. At this speed the boost is about twenty pounds.

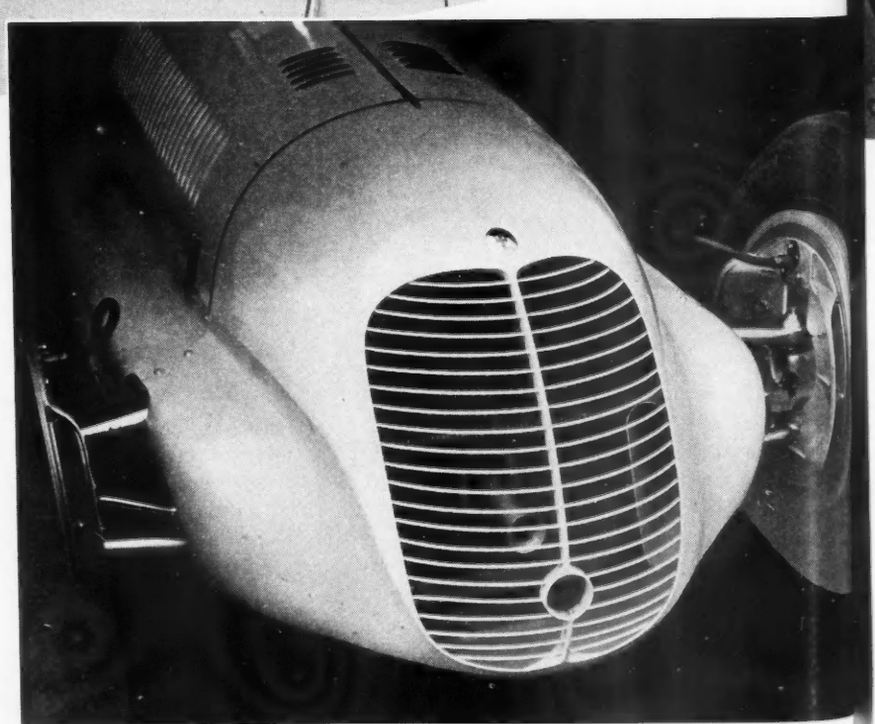
On the Bowes engine in Rex Mays' Bowes Seal Fast Special, the centrifugal blower turns a little faster with regard to the engine—more like 5 to 1. The boost on this engine runs somewhat higher—toward 25 lb. at maximum speed of about 6500 r.p.m. Care has been taken in this design to provide torsional resilience in the blower drive, and the result is one of the most durable supercharged engines in American racing history. The method of obtaining this resilience, by



(Left) Intake side of Riganti's type 8CL 3000 Maserati engine. Note the external diagonal ribbing of the crankcase (B). Also the small plates (A) which give access to the fingers and rockers that operate the four valves per cylinder. This engine is structurally similar to the type 8CTF Maserati shown on pages 498 and 499, but differs in detail.

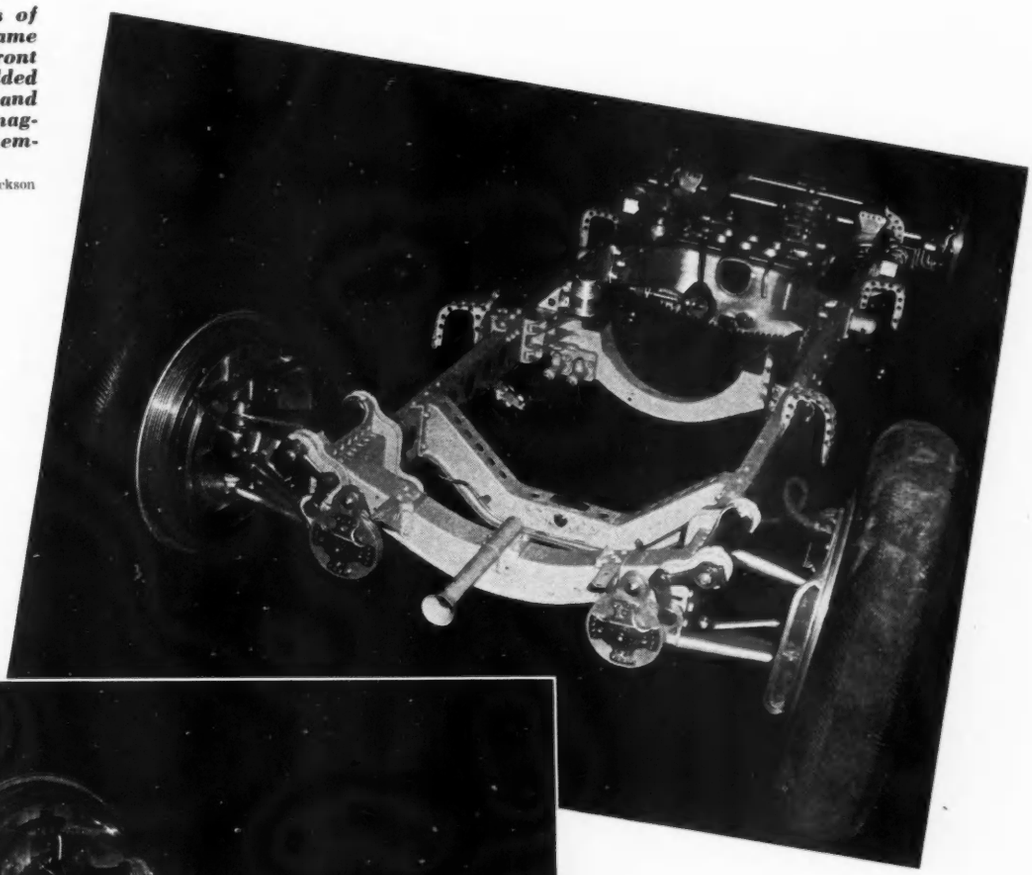
Photos by Eddie Hoff

(Below) Nose of Raul Riganti's type 8CL 3000 Maserati. The scoop shaped funnel gathers and conducts air to the carburetors. The fuel line is finned and carried across the air stream in front of the radiator in order to obtain some cooling.

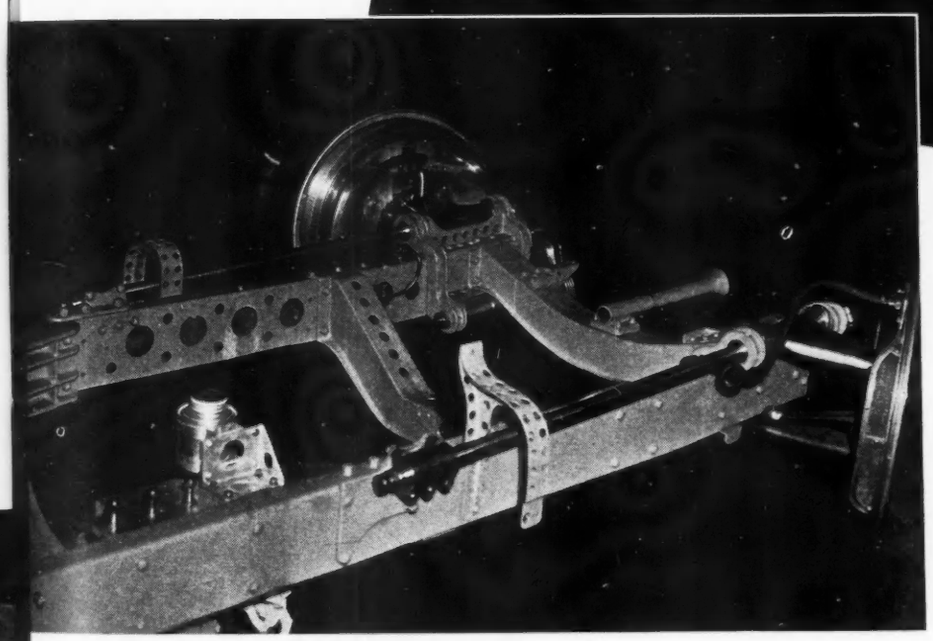


(Right) Structural details of Maserati 8CTF chassis. Frame is welded box section. Front two cross members are welded box type. Center member and oil tank—X member are magnesium alloy. Two rear members are steel tube.

Photos by Robert T. Jackson



(Below) Front suspension mounting and torsion bar arrangement on Maserati 8CTF.



means of a fairly long driving shaft free to deflect torsionally, is shown on page 502. In this design the movement during deflections of the driving shaft is not limited.

The Harry A. Miller double entry blower used on the four wheel drive cars is driven through an epicyclic step-up. The planetary drive is carried through two spring loaded studs by means of which the deflections due to inertia can be regulated. The Harry Hartz entry, driven by Mel Hansen, has a blower drive which also accommodates inertia loadings through a torsionally deflecting driving member. In this arrangement the deflection is limited by positive stops after a certain amount of movement has taken place.

From these points it may be seen that American racing engine designers are just as solicitous of durability as of performance. It might even be said the latter suffers somewhat in favor of the former.

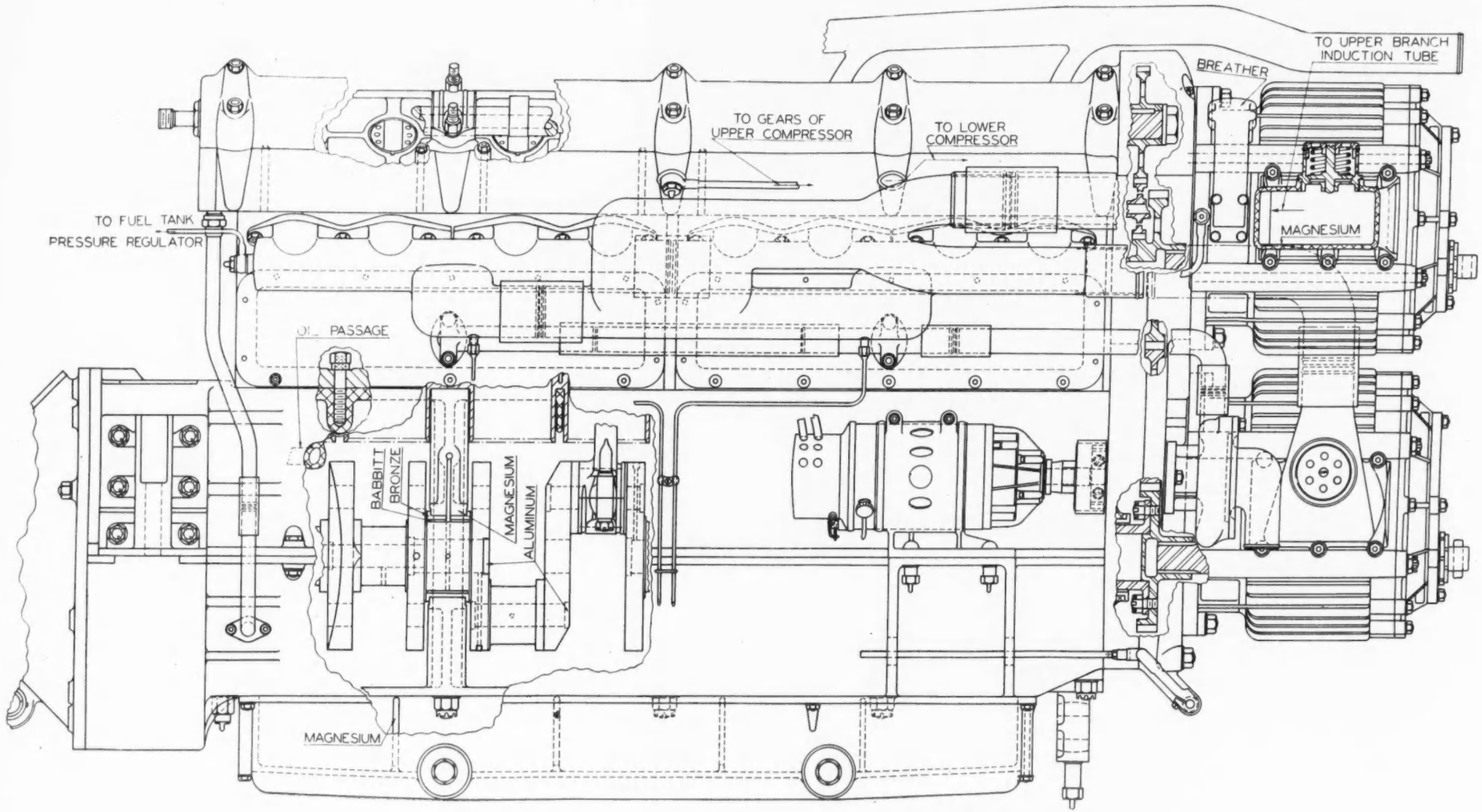
This is at least a partial explanation of why the foreign engines can make relatively good showings against our own racing powerplants. Indeed it was not until the Shaw win in 1939 that any strong evidence of foreign engine reliability was presented in recent years. Until that time even foreign racing authorities were inclined to view a 500-mile race with some misgivings toward the staying powers of their engines over that distance.

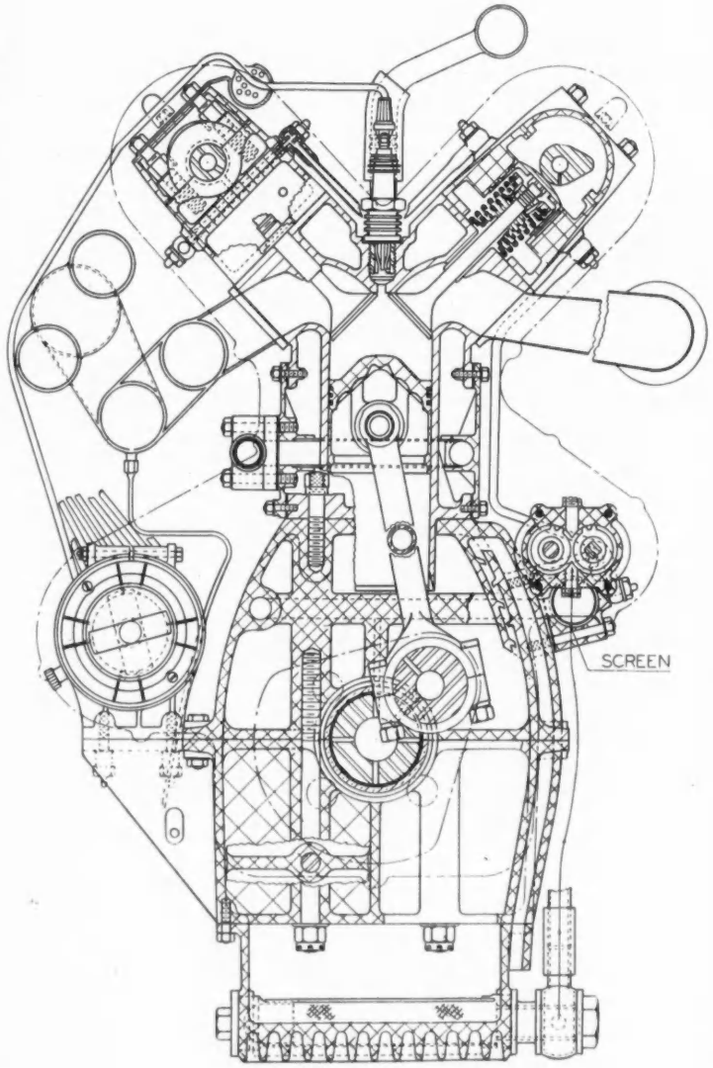
By way of summation on engine topics it may be said that foreign practice is represented by split type crankcase construction, while the American convention has been the cellular or barrel type case with diaphragm or flanged main bearings. The split type has the advantage of maximum rigidity. The cellular type is much more compact. In fact, the typical American engine design, as represented by the Offenhauser 270 shown on page 504, is probably neater and more finished in appearance than any of the foreign engines.

As for power outputs, that is a different story. The Paul Riganti entry—the type 8CL 3000 Maserati—is rated by its makers at 420 hp. at 6800 r.p.m. Whether it actually delivers that figure or not, even the most confirmed booster for American racing prestige will admit the newest Maserati product is undoubtedly more powerful than any of our own engines.

Side view of Maserati type 8CTF, as used in the Boyle and Schell entries. This engine typifies recent European racing practice in structural design — the split type crankcase of light alloy, usually magnesium, with bronze backed shell bearings, babbitt lined in this case, or roller bearings in some cases.

(From original drawing by Robert T. Jackson)



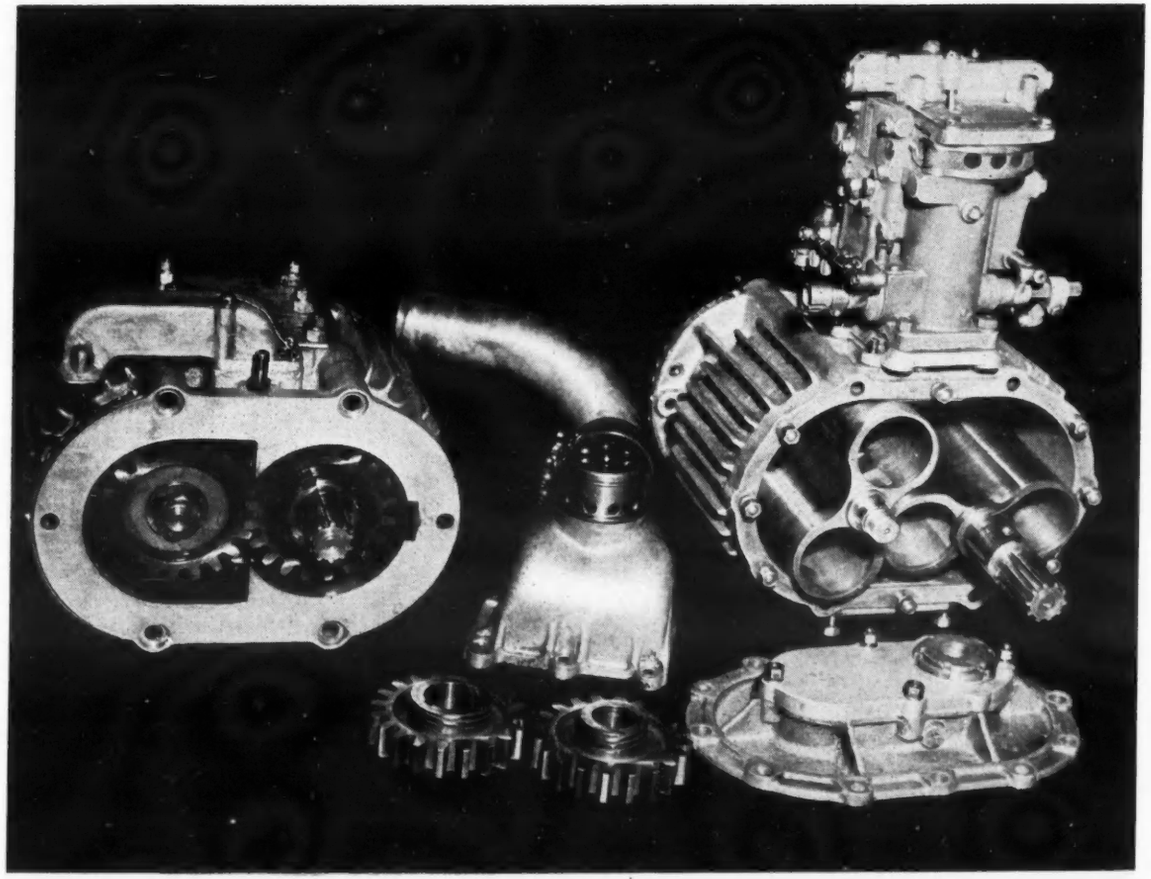


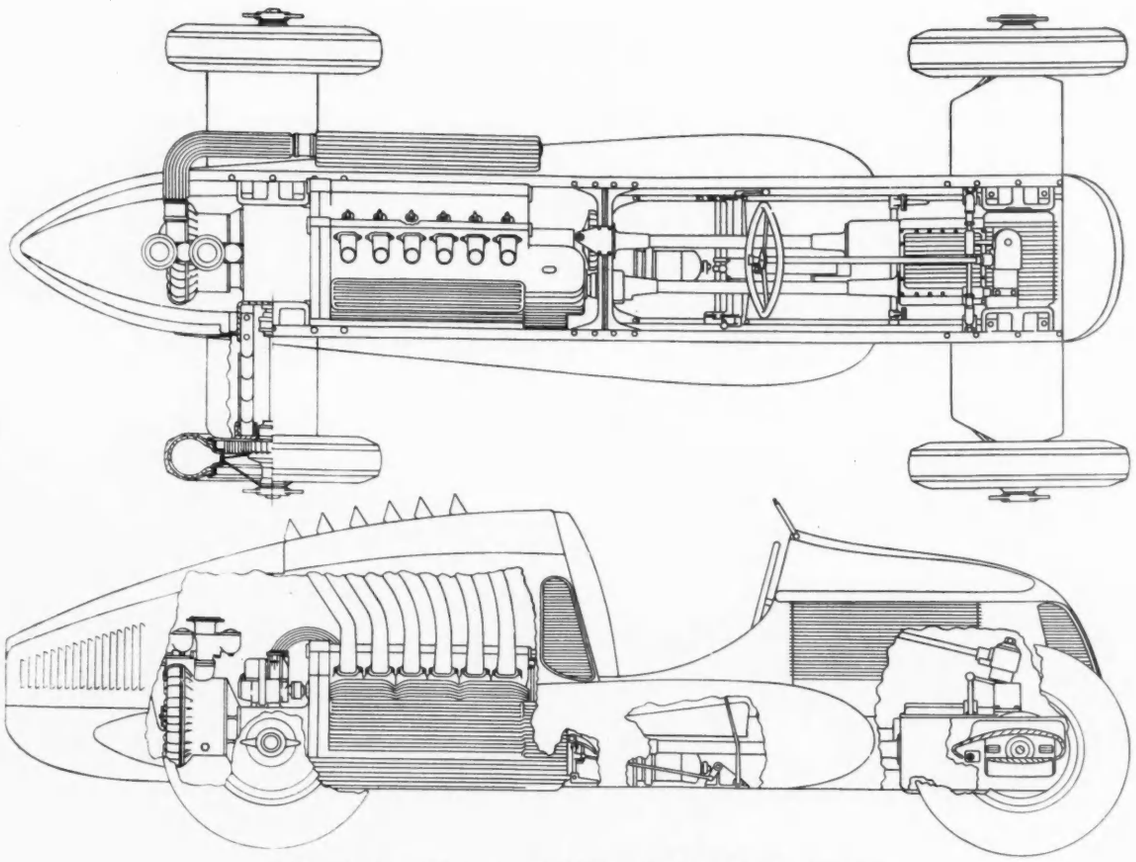
End elevation 8CTF Maserati. The 8CL 3000 type, as found in the Raul Riganti entry, is basically similar in structure, but has four valves per cylinder, bore and stroke of 78 mm. each, and valves are operated through rockers and finger followers instead of cups, as shown here for the 8CTF. Both types employ two Rootes compressors, of apparently identical size and construction, with one Memini carburetor for each compressor.

(From original drawing by J. C. Thompson and Robert T. Jackson)

Rootes compressors of Maserati 8CTF engine. Rotors are steel.

Photo by Robert T. Jackson



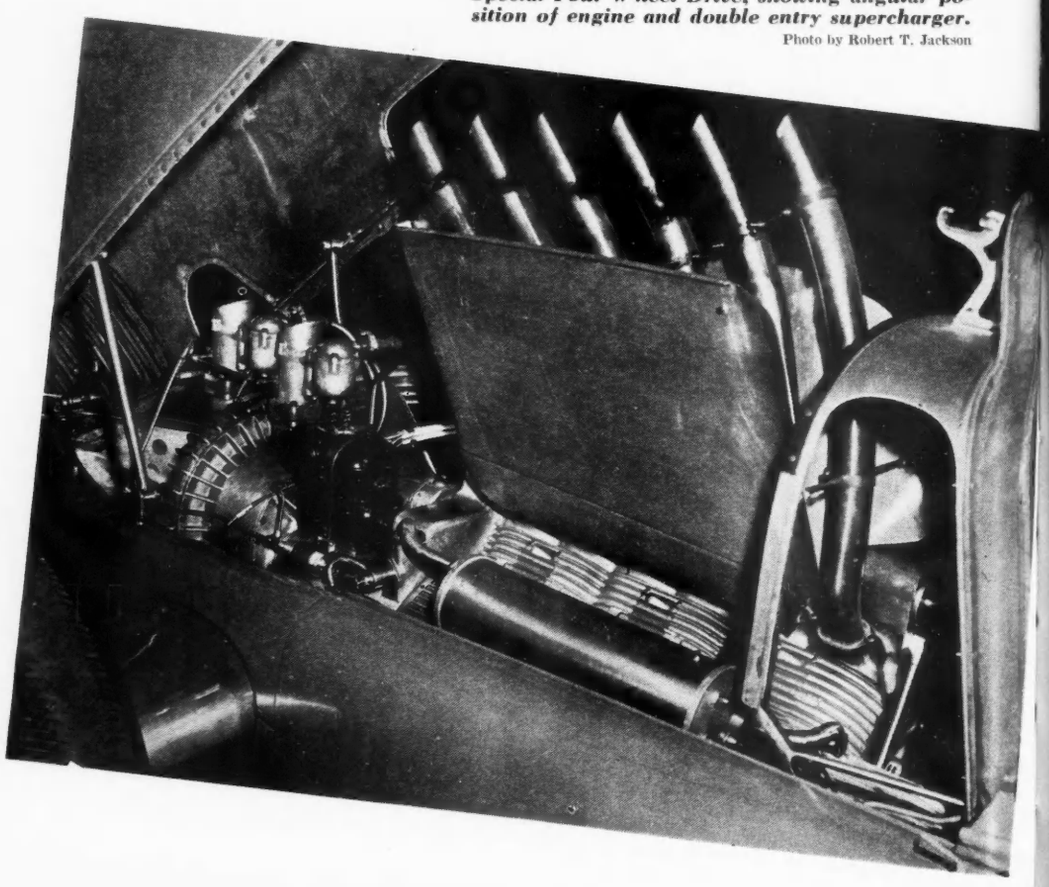


(Above) Assembly views of Miller Four Wheel Drive cars.
(From original drawing by James F. Drake, Jr.)

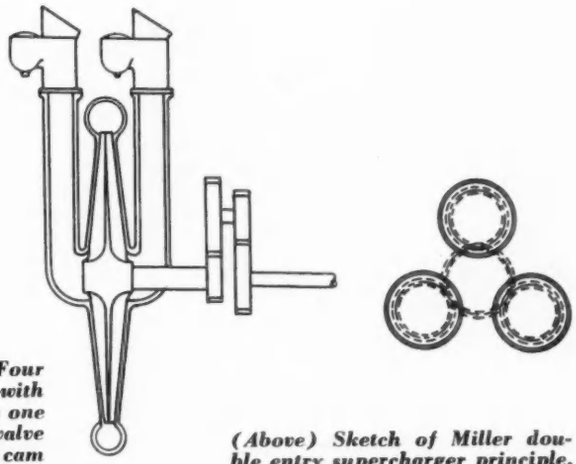
The Bowes Seal Fast engine has not been checked on a test stand, but if performance is any criterion it delivers an honest 350 to 375 hp., using 100 octane gasoline for fuel. The Sampson 16 cylinder engine, burning an alcohol blend, is delivering something close to that figure. Our unsupercharged engines are quite steady in performance, if not as flashy as the blown examples. An output of 250 to 260 hp. is probably obtained from the 270-in. Offenhauser engine under ideal conditions. From this figure the scale reads downwards. But under present conditions at Indianapolis a four-cylinder unblown engine is perhaps the most economical approach to a racing car which must be constructed within a moderate cost estimate.

Stock engines have virtually vanished from the scene at Indianapolis. This

(Below) View of engine in Harry A. Miller Special Four Wheel Drive, showing angular position of engine and double entry supercharger.
Photo by Robert T. Jackson



year Phil Shafer and his ubiquitous Buick-powered racing car were again on hand. This time Shafer is the sole survivor of the once thriving stock engine coterie. The reason for this is, of course, that the International Formula for 1938-1940 produced the most competitive group of racing automobiles and engines since the days of the 91.5-cu. in. engines of 15 years or so back. Under such conditions it is very difficult for a stock engine to make a showing in competition with the specialized creations.

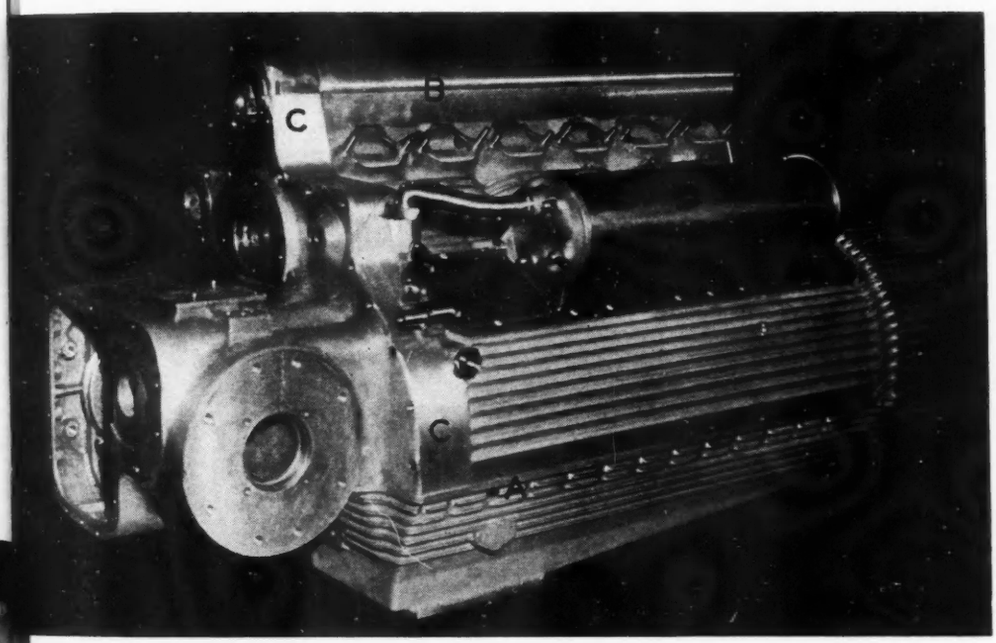


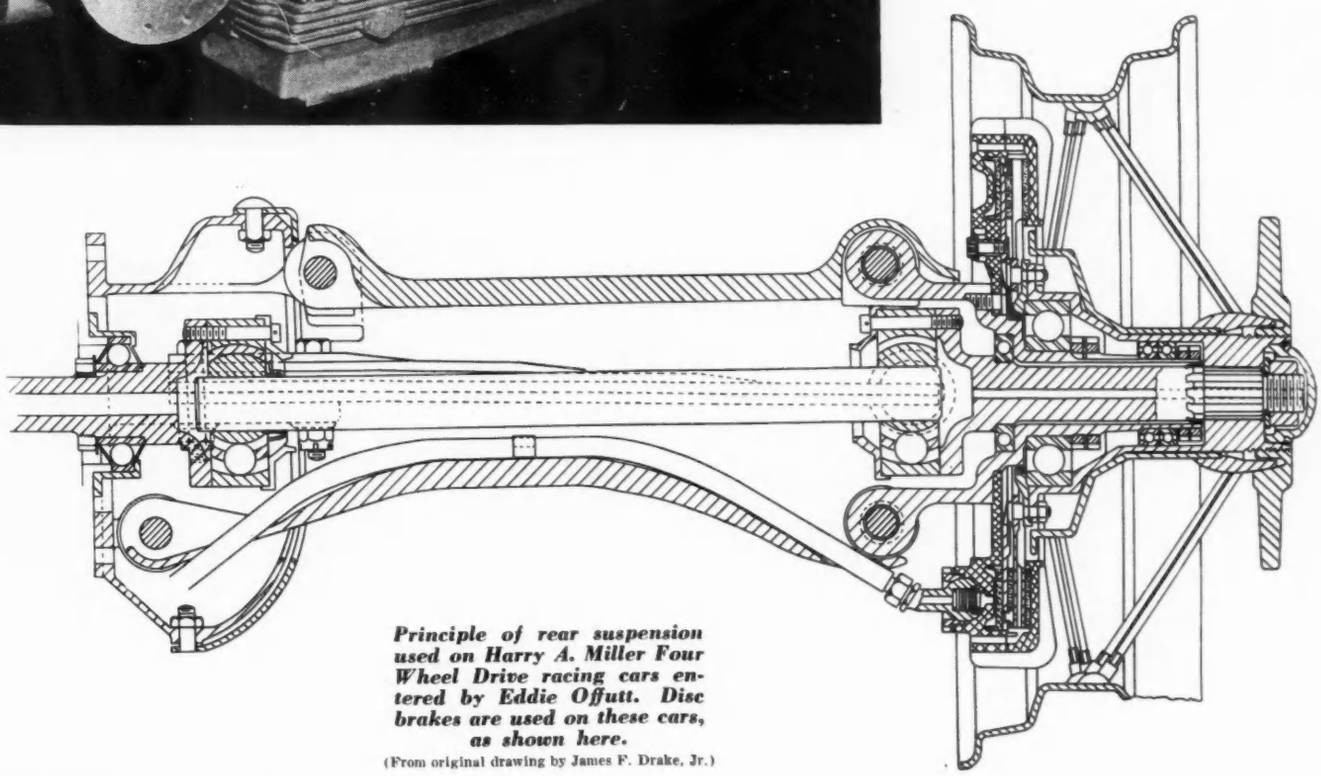
(Above) Sketch of Miller double entry supercharger principle, and planetary drive. Impeller turns 32,000 r.p.m. at 7000 r.p.m. of engine. Boost pressure is approximately 20 pounds at that speed. One advantage claimed is reduction of thrust loading on impeller bearings, with consequent improvement in durability.

(From original drawing by James F. Drake, Jr.)

(Below) Basic engine structure of engine in Harry A. Miller Special Four Wheel Drive car. This is shown in its normal position in the car—with the cylinder center line inclined 45 degrees from the vertical. Block is one casting. It is made of aluminum, with steel sleeves and bronze valve inserts. Block casting is one unit which includes everything between cam housing center line (B) and sump (A) and half of the gear tower (C). Gear tower cover includes housing for rear drive gears and transfer shaft to front axle driving mechanism. Supercharger assembly goes behind the drive gear housing. The large cylinder visible in foreground is oil filter.

Photo by Robert T. Jackson





Principle of rear suspension used on Harry A. Miller Four Wheel Drive racing cars entered by Eddie Offutt. Disc brakes are used on these cars, as shown here.

(From original drawing by James F. Drake, Jr.)

Descending to practical details, it may be noted that under the current rules at Indianapolis racing cars are more carefully constructed, operated, and maintained than ever before. One of the finest regulations which has ever gone into effect at Indianapolis is the rule which requires Magnaflux examinations of certain highly stressed parts such as steering knuckles and arms. Under the stimulus of this rule many owners are now insisting on Magnaflux tests of all important parts of their cars, whether required or not.

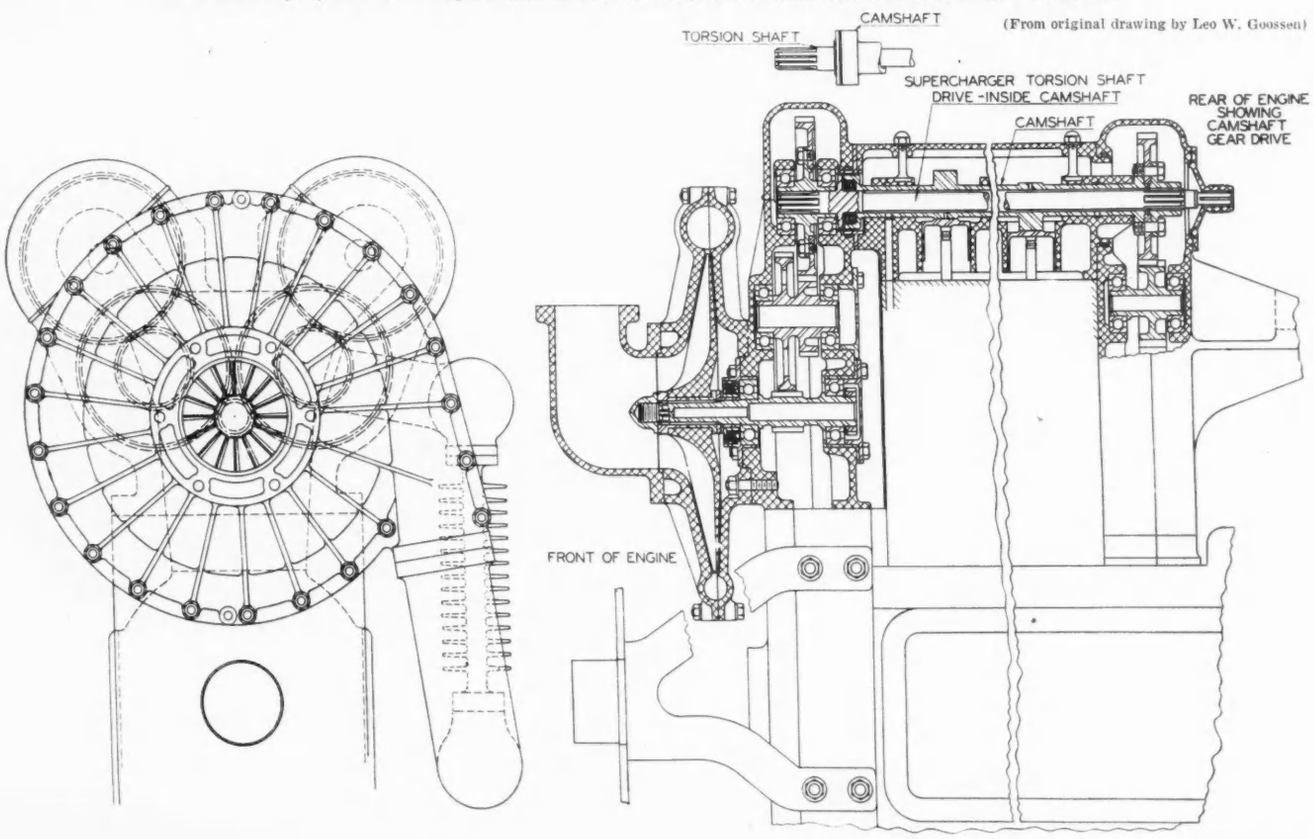
This has made for safety in a structural sense, and it is rare, indeed, to learn of a failure having taken place in any part which has been properly examined and passed as having shown no indications. Although not mentioned specifically in the rules, most mechanics are now checking crankshafts, connecting rods, piston pins, valves, etc., by means of the Magnaflux equipment. The result has been the rejection of a number of parts which might have caused trouble of a serious nature.

Most cars are now equipped with fuel pumps—usually of the integral by-pass-relief-valve type as used on aircraft engines. This has also made for greater safety and durability. In few cases have these pumps been mounted sufficiently low to insure a good head of gravity from the tank to the pump, yet all of them seem to be operating with satisfaction. Some are driven at camshaft speed, which in a racing engine is about twice as fast as aircraft practice when one considers that the maximum r.p.m. of the racing motor is almost three times that of the airplane engine. Even so, the pumps seem to stand up well. Of course, some of them are mounted on geared reduction drives, which brings their maximum speeds down to aircraft engine limits.

Another factor in safer racing conditions is the development of better tires. The Firestone racing development organization has succeeded in improving wear characteristics considerably since the 1939 race. In addition to that, the Firestone people are pioneering in the manufacture of light alloy rims and lighter wheels for use with larger tires. This year the tire engineers are directing a return to 20 in. diameters, after having had to cope with the unfavorable wear factors of wheel diameters as small as 16 inches the past few years. Resort to the smaller diameters was originally made to reduce total wheel and tire weight, since no light wheels were at that time available in the United States. The light wheels were in demand to assist in solving shimmy, hop, and chatter problems encountered with the increasing speeds which came along about 1936.

Carburetion, once the bane of a racing mechanic's struggles, has apparently yielded to treatment from several angles. Carburetors themselves have remained unchanged basically for some years, but knowledge of fuels and engine operation has improved steadily. This has led to much better handling of carburetion by designers and mechanics alike and the result has been very noticeable. Mixture distribution remains a trouble-trouble point in some cases, even in supercharged engines, but not nearly so frequently as in former years.

Details of supercharger, drive, and intercooler manifold on the Bowes Seal Fast entry driven by Rex Mays. This unit and the engine itself were originally designed by and for Louie Meyer, who constructed and drove the Bowes car until his retirement last summer.


CAMSHAFT
TORSION SHAFT
(From original drawing by Leo W. Goossen)
SUPERCHARGER TORSION SHAFT DRIVE - INSIDE CAMSHAFT
CAMSHAFT
REAR OF ENGINE SHOWING CAMSHAFT GEAR DRIVE
FRONT OF ENGINE

Until the present Formula was adopted for Indianapolis, brakes were regarded as a necessary evil only, and not as an adjunct toward winning the race itself. Thanks to the foreign influence, American builders have developed much better brakes for Indianapolis. There is nothing radically new in this line with the exception of the latest developments in the disk brakes which have been the subject of much experimenting the past couple of years. The more or less conventional internally expanding shoe brakes have been greatly improved by the use of light alloy drums with shrunk in liners, screwed to the drum casting. This practice, long used by foreign designers, permits much greater drum rigidity for a given weight and also offers maximum heat dissipating qualities.

Disk brakes are installed on the Harry A. Miller four-wheel drives and also on the Joe Lencki entry driven by George Connors, although there are apparently two entirely different designs involved. The Miller brakes are said to have about 90 sq. in. of frictional area per brake. Those on the Lencki car are claimed to have over 300 sq. in. The Lencki brakes are based on the original disk brake designed by Joseph Milan, but have been developed specially for this application. The rubbing surface is aluminum, rather an unusual material for such purposes, but the claim is made that it is superior to ferrous metals tried. Critics of the disk brake principle point out that it is very difficult to dissipate the heat resulting from continual and violent applications, such as would be experienced in road racing.

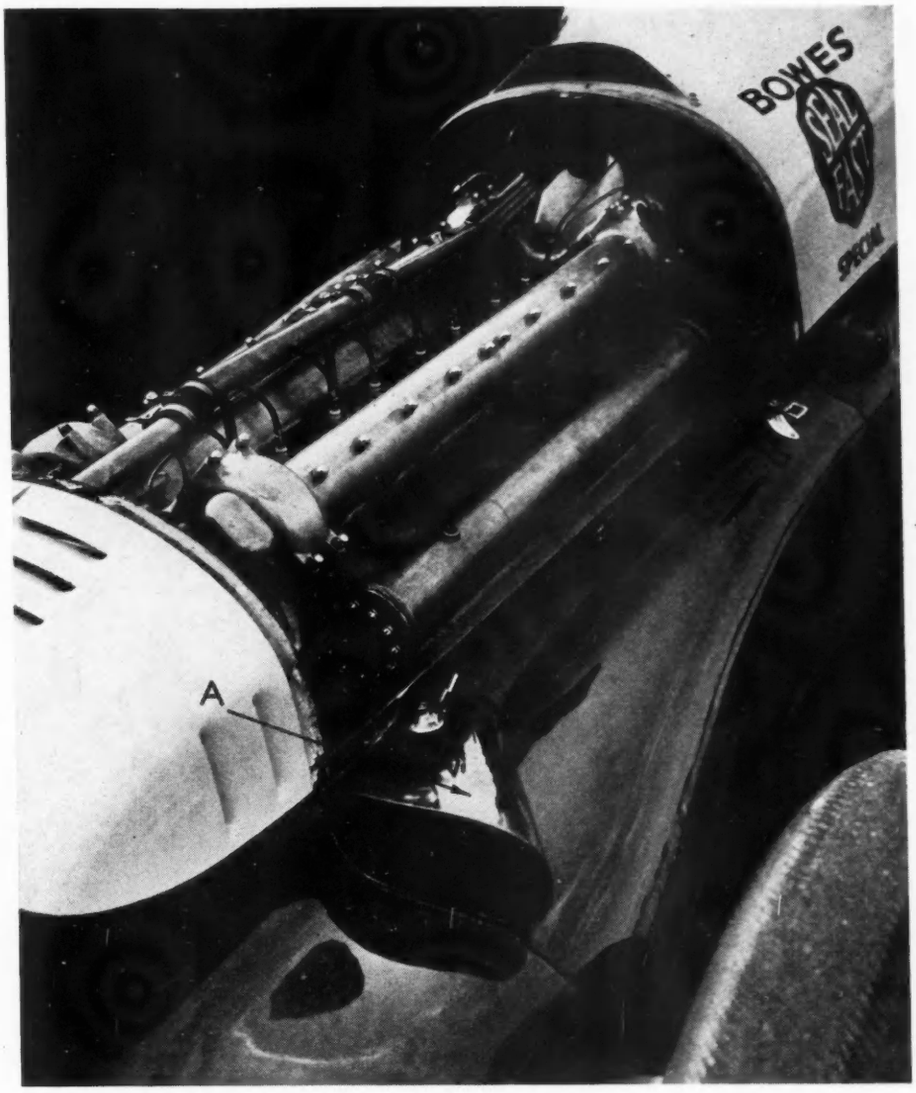
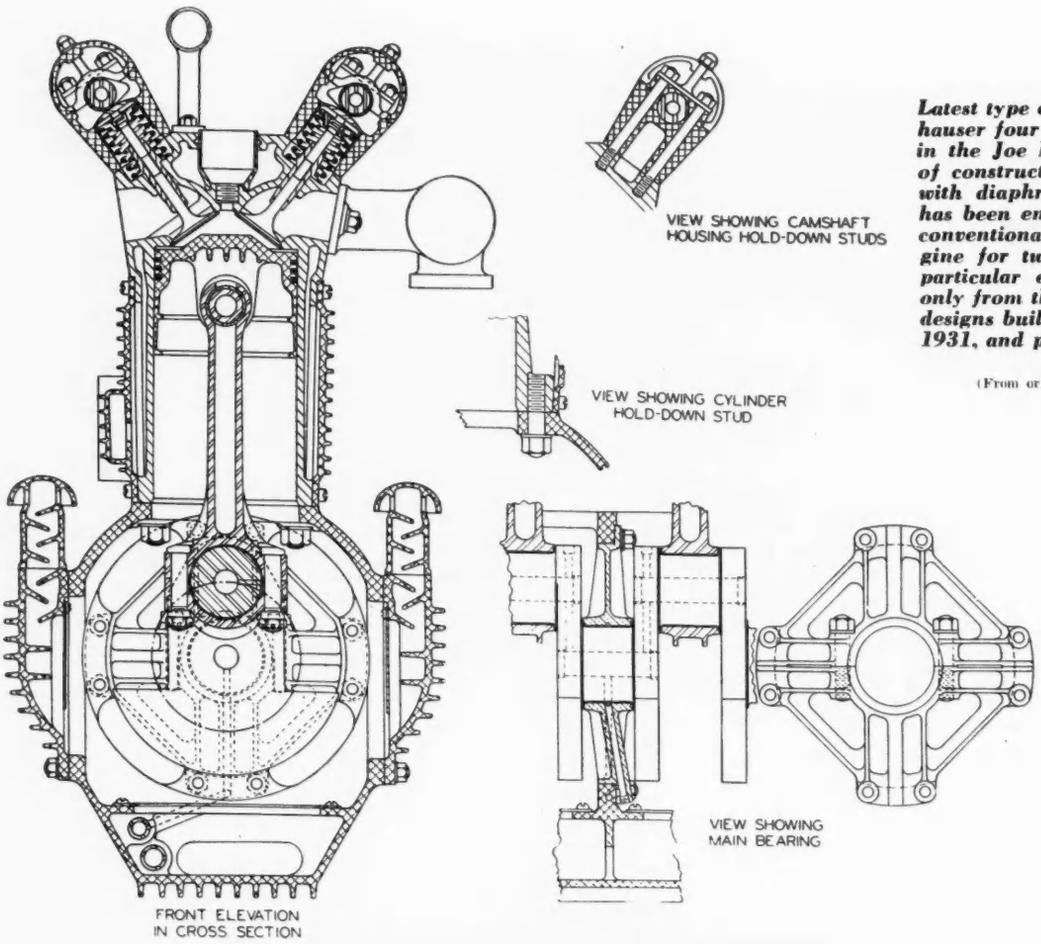


Photo by Eddie Hoff

Intake side of the Bowes Seal Fast Special driven by Rex Mays. The scoop (A) forces air over the intercooler manifold. This manifold is also shown on the opposite page.

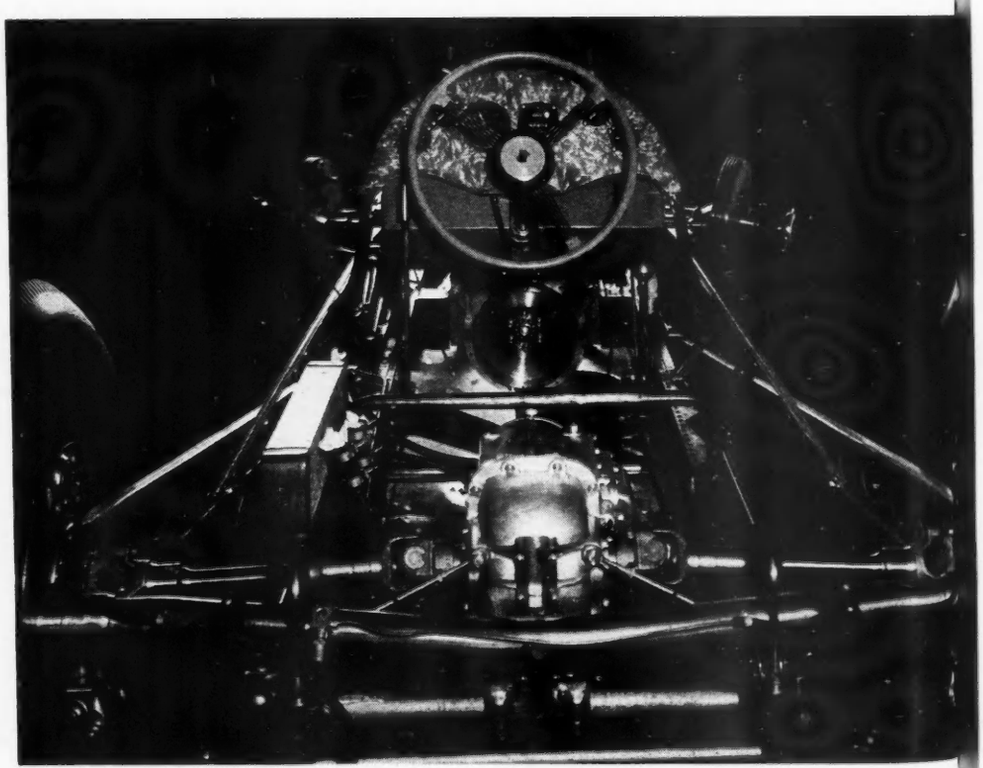
Another factor which is apparently of great importance in controlling the behavior of the wheels on racing cars at Indianapolis is the matter of dynamic balancing. For the past few years dynamic balancing has entirely supplanted the former practice of laboriously balancing for the static condition by hand. The dynamic balancing seems to provide very good results in the way of eliminating hop and chatter from any given wheel and tire set-up, but one flaw has shown up to date in the case of the lead weights which must be fastened to the rim. So far no method of attaching this weight has been devised which will absolutely guarantee its adherence to the rim under all conditions. This is particularly noticeable on the light alloy rims of thin cross section, as found on practically all the foreign cars, but new ways to apply these weights are now under consideration and this difficulty will be remedied.

Steering gear problems are not entirely solved. The recent repaving of certain sections of the course with asphalt has been responsible for a swing to slower steering gears because the cars stick better—do not slide as much and, therefore, do not require such quick correction. A rather annoying tendency on the part of the foreign cars is a relatively violent shimmy condition set up at low speeds—50 to 80 m.p.h.—with speedway tires only. The road racing tires, having a very pronounced tread pattern, do not behave this way at all. As yet tire engineers have not accounted for this difference. It can be very serious under certain circumstances—such as a long period of operation under the caution flag when the running speeds would


VIEW SHOWING CAMSHAFT HOUSING HOLD-DOWN STUDS
VIEW SHOWING CYLINDER HOLD-DOWN STUD
VIEW SHOWING MAIN BEARING
FRONT ELEVATION IN CROSS SECTION

Latest type of 270 cubic inch Offenhauser four cylinder engine as used in the Joe Marks entry. This type of construction—cellular crankcase with diaphragm main bearings — has been employed in almost every conventional American racing engine for twenty years or so. This particular engine differs in detail only from the original four cylinder designs built by Miller beginning in 1931, and produced by Offenhauser since 1934.

(From original drawing by Leo W. Goossen)



View showing structural details of the DeBion Bouton type rear suspension of the Sampson Special 16 cylinder entry. Springing is by torsion bars. One of these is visible.

Photo by Charles J. Bell

fall within the shimmy range. It could also become rather trying during application of the brakes to make a quick pit stop.

General chassis considerations point definitely to the Maserati chassis as being perhaps the most suitable layout for the Indianapolis speedway. They ride nicely, steer and handle beautifully, have very good brakes, and are easy on tires. The chassis frame is welded box section, well braced transversely, and the front wheel suspension is independent, by torsion bars. The rear springing is conventional, being accomplished by quarter-elliptic springs in conjunction with a radius rod to the frame for absorbing and transmitting brake torque. Drive is through the torque tube.

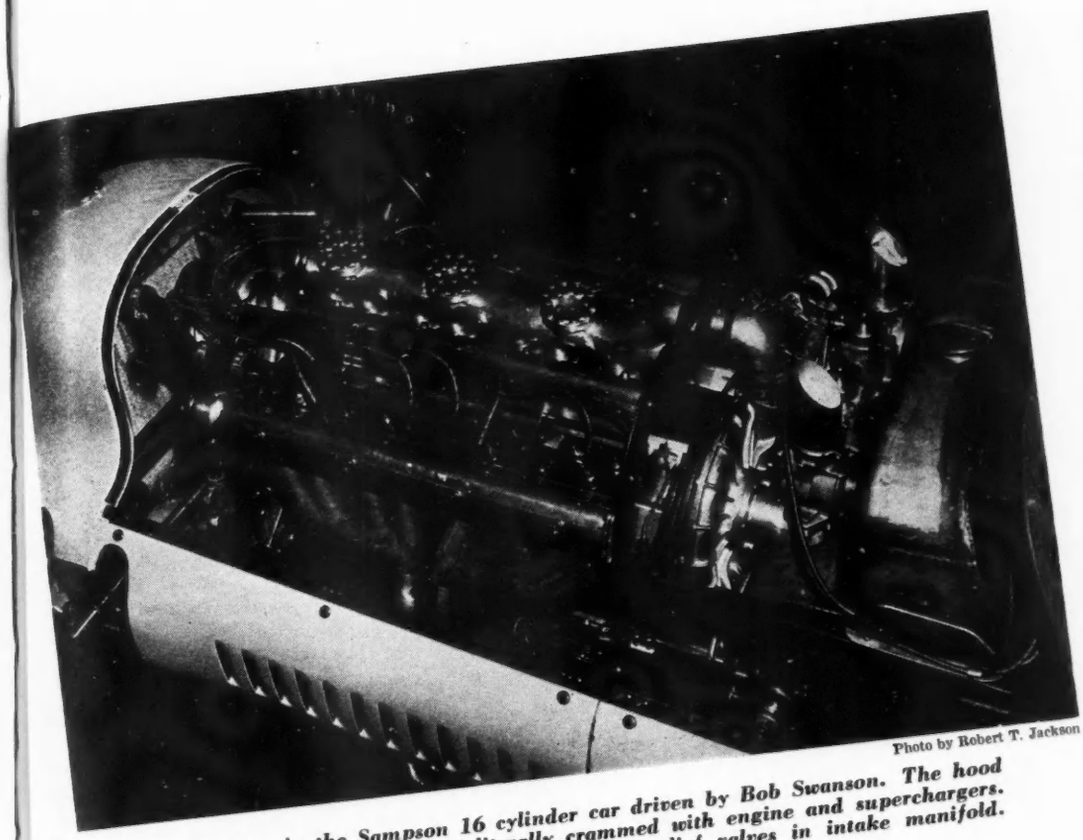


Photo by Robert T. Jackson

Engine in the Sampson 16 cylinder car driven by Bob Swanson. The hood and cowl of this car are literally crammed with engine and superchargers. Spring loaded plates are back pressure relief valves in intake manifold.

Steering is by separate drag links to each front wheel—there is no track rod. Toe-in is excessive, judged by our standards—from $\frac{5}{8}$ to 1 in., but even at the latter dimension the front tires do not wear rapidly. Knuckles are carried on fairly large diameter steel balls, bearing in bronze sockets. Details of front suspension layout are shown in photographs on page 497.

As for American chassis designs, with the exception of the Harry A. Miller cars, only one or two have made any approach to independent suspension or the DeDion type of rear axle layout. The Sampson Special has the DeDion type of axle, as shown in the illustration on page 504. Springing is by torsion bars. In front the Sampson is sprung on superimposed quarter elliptics, similar to the familiar layout employed for many years on front drives.

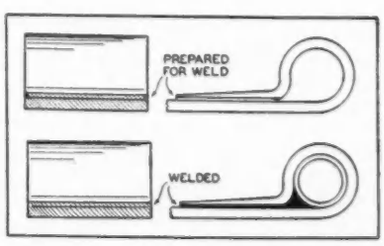
With some reason, American racing designers have avoided involvement in experiments with independent suspensions. If racing continues at the Indianapolis speedway for another couple of years this situation is bound to change, and any new American cars of strong design will be independently sprung in front at least, with correspondingly improved steering gear layouts.

For the present, the American cars are on fairly even terms with such foreign representation as will be on hand in this year's race. This applies particularly to engines. Regarding the chassis, most observers are of the opinion that a chassis like the Maserati can be driven farther and faster without fatigue on the part of the driver than almost any of the American jobs. Even if the engine of the Maserati type 8CTF is not quite as "hot" as several of our own powerplants, there is a strong possibility that any difference at that point will be more than balanced by the Maserati's admittedly superior chassis. That's where the designer's work really counts in the 500-mile race nowadays—in the chassis.

Note: Use of the material supplied by courtesy of James F. Drake, Jr., is gratefully acknowledged. Also the services of Leo W. Goossen, draftsman-co-designer of many fine American racing engines and cars. The cooperation of Louie Meyer and the Boyle Racing Headquarters for permission to use material covered in the accompanying drawings is gratefully acknowledged.

Improved Spring-Eye Construction for Leaf Springs

AN IMPROVED spring-eye construction for truck and bus leaf springs has been worked out by the E. R. Merrill Spring Co., New York, and is illustrated by the accompanying drawings. The eye, instead of being rolled in the usual way, is provided with an extension paralleling the master leaf. The edges of this extension are beveled for welding. In welding, use is made of a welding rod of 18-8 stainless steel which also contains some molybdenum and columbium. It is claimed that a complete bond is effected, and that there is no coarsening of the grain in the transition zone at the weld. Heat-treatment, normalizing and drawing operations are performed after the welding process is completed.



Merrill welded spring eye

Piston Production at

AFTER a considerable period of production planning and experimentation, the Pontiac Motor Division of General Motors placed in operation early this year an interesting and exceedingly compact department for machining pistons on their six- and eight-cylinder engines.

Although the parallel lines of production equipment differ somewhat because of differences in required volume, there are a number of places where both sizes of pistons are converged to the same machines for similar operations.

Pontiac pistons, as is well known, are made of a special alloy of nickel-chromium iron. This type of alloy possesses great physical strength and due to its unique properties makes it possible to cast pistons with extremely fine wall sections, thus reducing inertia loads and contributing excellent heat transfer. The castings are received from the foundry, inspected, then annealed in an automatic continuous furnace at a temperature of 1100-1150 deg. Fahr., before machining.

Finish-machined pistons are held within a narrow band of tolerances and are sorted and marked in four standard sizes A-B-C-D—each one varying from the nominal size by steps of 0.0005 in. Complete interchangeability of piston and rod assemblies is assured by machining to a standard weight, plus or minus 1/16 ounce. All six-cylinder pistons must weigh 1 lb. 11⅛ ounces, plus or minus 1/16 ounce.

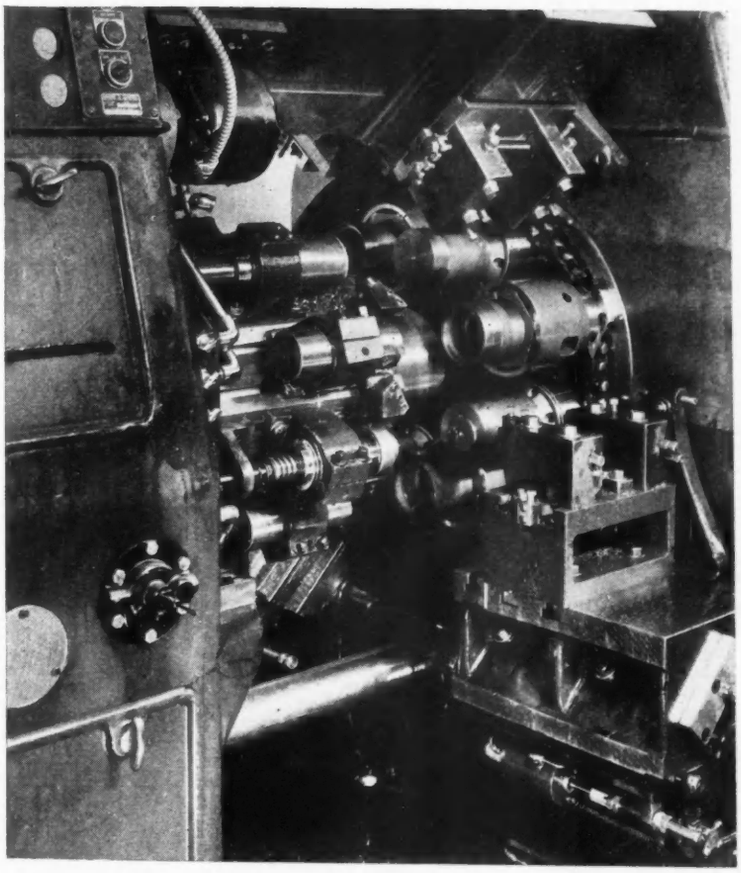
One of the most significant features of the piston machining department is the skill with which the sequence of operations from start to finish has been

Close-up of the compact quality control station where pistons are checked for weight and size, then graded and stamped. Note the tiered gravity conveyors directing pistons to the inspection benches.

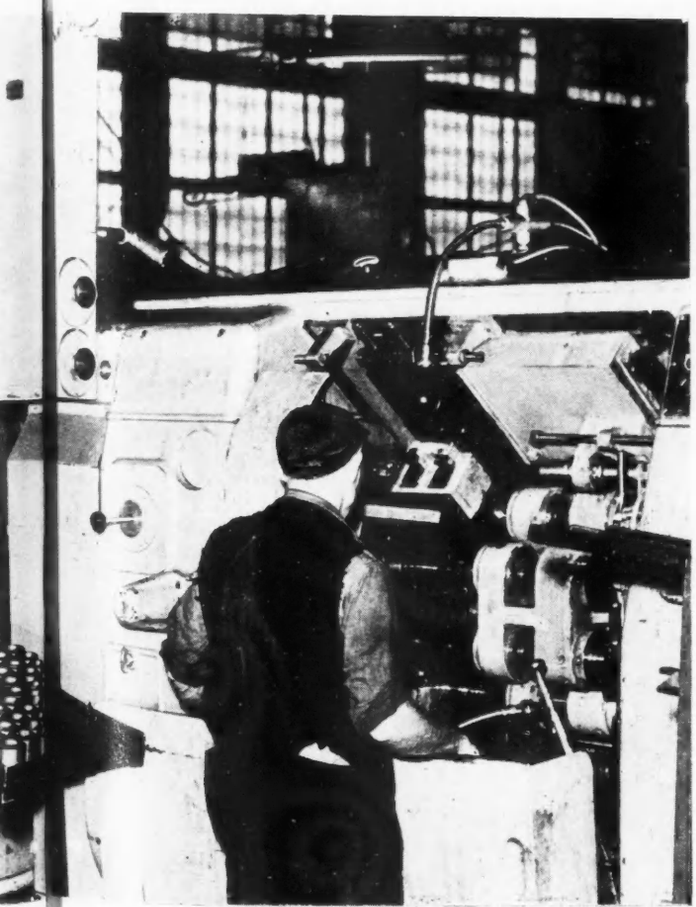
This is the Forty-ninth in the series of monthly production features

Pontiac

bring's out a unique sequence of operations that has been organized and coordinated by an efficient materials handling system



Close-up of the work-station of one of the eight-spindle Acme-Gridley machines, giving the detail of chucks and massive tool holders.



View of battery of two National Acme-Gridley chucking machines for machining eight-cylinder engine pistons. Directly in the background (not visible in this photograph) is the battery of four Acme-Gridley machines of similar type for handling the high production six-cylinder engine piston.

organized and coordinated by the materials handling system. In essence, materials handling is achieved most economically by the use of simple gravity conveyors which link the individual machining operations and carry the product through to the inspection stations. In addition to the function of transport, the materials handling system also serves the purpose of storage by building up suitable banks for certain operations. In a few cases, this is accomplished by tiers of gravity conveyors, in other instances the bank is produced by increasing the width of the conveyor.

Some of the detail mentioned above will be noted in the illustrations reproduced with this article.

Before we consider the actual sequence of operations on the six-cylinder (high production) piston, it is of interest to note that it is imperative to keep free of tin-plate the ring grooves, piston pin holes, piston head, and the ring lands. This is accomplished ingeniously but simply by the use of rubber seals. Just before the pistons are hung on the racks for plating, special rubber plugs are inserted in the wrist pin holes, a molded rubber cover is stretched over the head and extending over the ring lands while an additional rub-

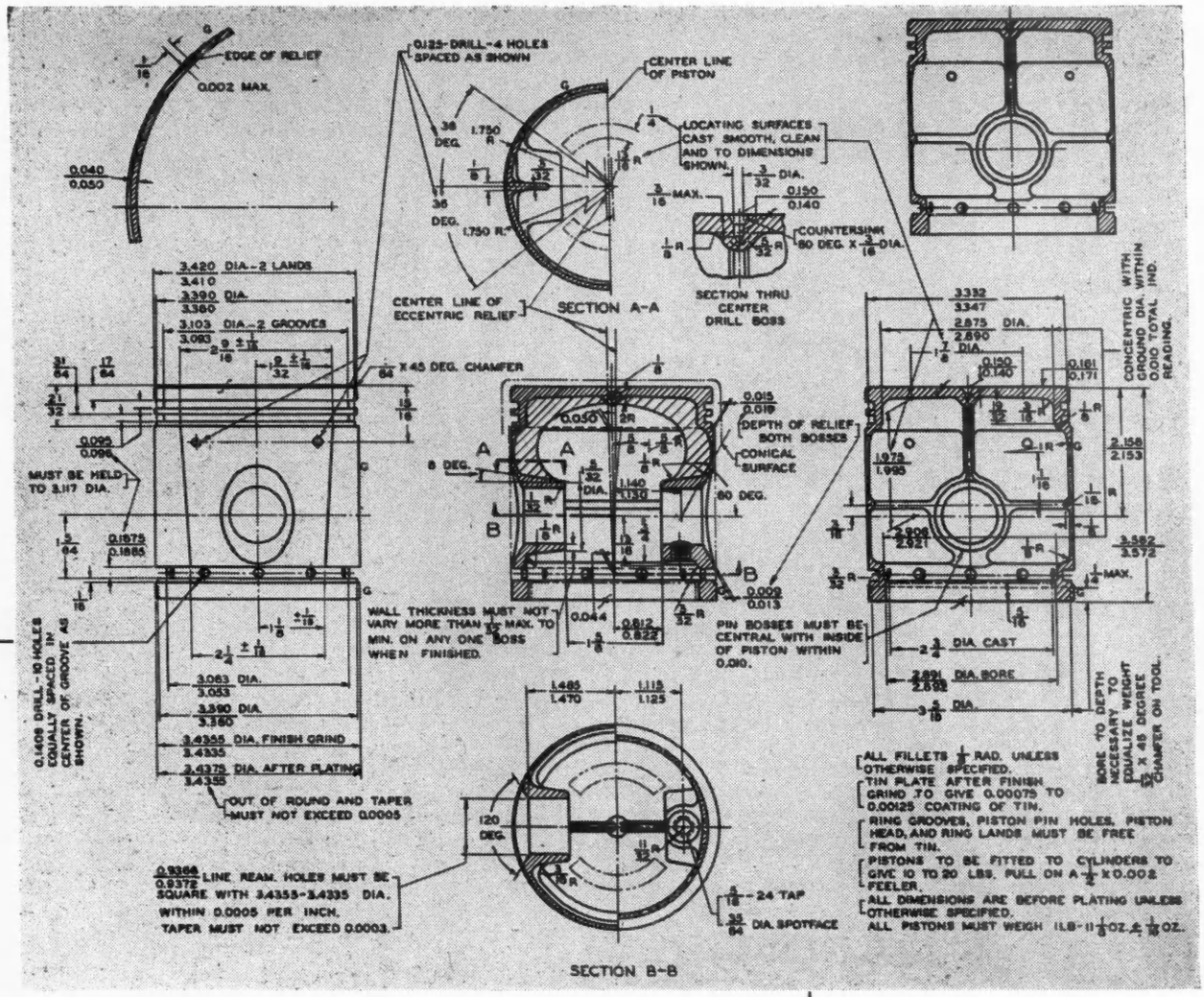


Table 1—Machining Operations

RECEIVING inspection

HEAT TREAT
Continuous piston annealing furnace.

ROUGH TURN outside diameter,

ROUGH FACE head and center closed end, rough and finish bore skirt, rough and finish face skirt and finish ream skirt.
6 in. model "RPL" 8-spindle Acme-Gridley chucking machine

FINISH TURN outside diameter, finish face head. **ROUGH** and finish turn ring grooves and turn ring lands.
6 in. model "RPL" 8-spindle Acme-Gridley chucking machine.

WASH
Pontiac washing machine

ROUGH DRILL wrist pin hole
Davis Thompson rotary drill

ROUGH GRIND outside diameter
No. 2 Cincinnati centerless grinder

SEMI-GRIND outside diameter
No. 2 Cincinnati centerless grinder

CHAMFER both sides of pin hole
Kingsbury double end drill

DRILL, SPOTFACE and **TAP** lock-screw hole
3-spindle Kingsbury machine

DRILL oil holes in lower ring groove and (4) ⅛ in. holes in outside diameter
14-spindle Kreuger drill

ROUGH and **FINISH BORE** wrist pin hole

Ex-Cell-O diamond boring machine

FINISH GRIND head
16-A2 Blanchard grinder

BORE for weight
24 in. Cincinnati drill
Toledo scales

Second **SEMI-GRIND** outside diameter
No. 2 Cincinnati centerless grinder

FINISH GRIND outside diameter
No. 2 Cincinnati centerless grinder

GRIND eccentric relief
10 x 36 Norton grinder

CLEAN and **TIN PLATE**
Frederic B. Stevens plating equipment

WASH and blow off
Blakeslee washer

BURR ring grooves
Porter-Cable lathes

INSPECT

Details of the Pontiac pistons showing sizes and small tolerances

ber ring is pressed into the lower ring grooves. After plating, these protective seals are removed and returned for further use at the plating station.

The reason for applying the tin plate after machining is to prevent damage to the coating from hot chips and embedded dirt.

Let us now consider the sequence of machining operations, listed in Table 1.

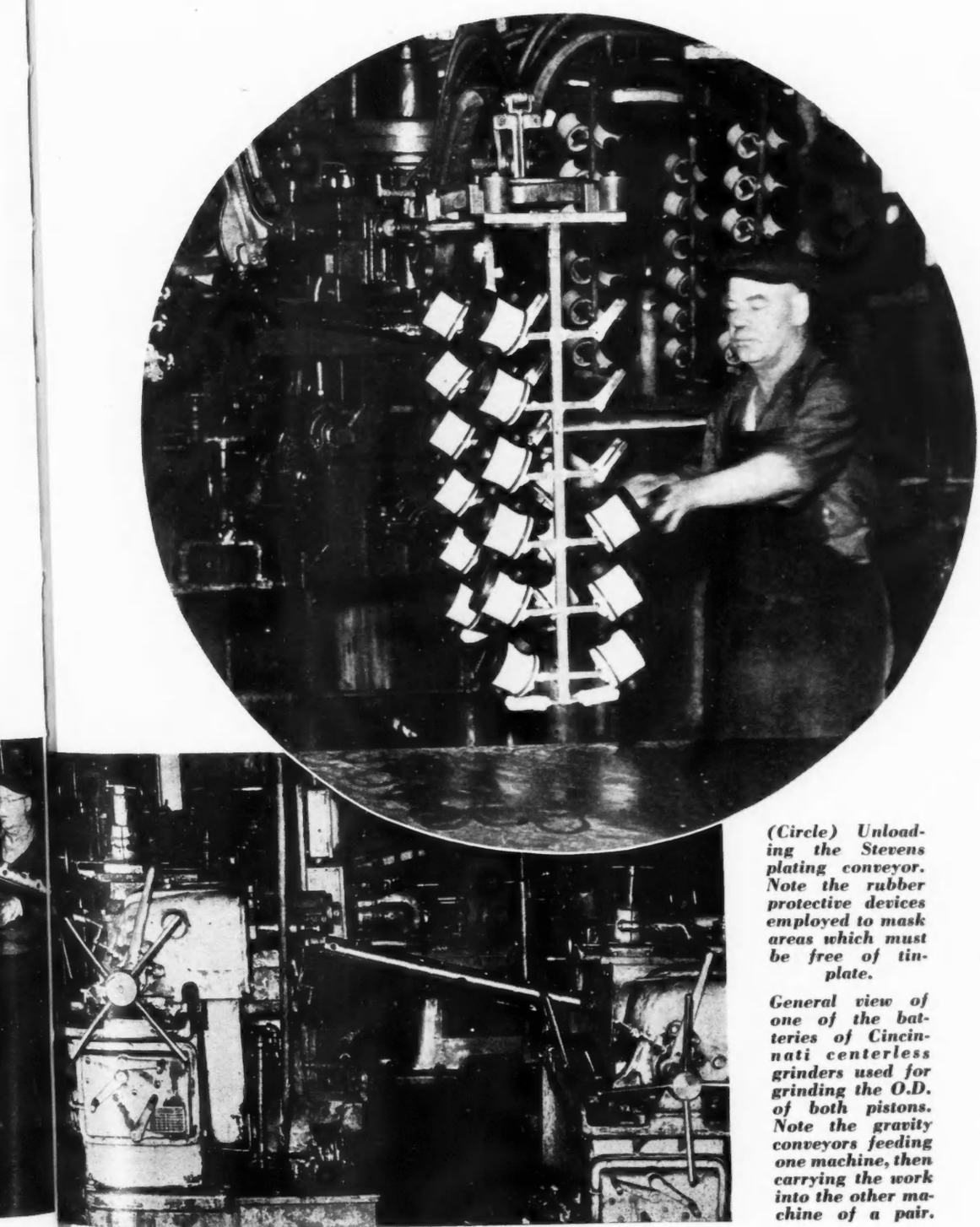
As mentioned earlier there are a number of operations in which the same items of equipment are used for both the six- and eight-cylinder engine pistons. These comprise—the annealing furnace, washing machines, centerless grinders, the plating operation, burring, and inspection. In the Cincinnati centerless grinders, in particular, it is necessary to make a change in set-up for each diameter. For this reason, the materials handling chutes are designed for large storage capacity so as to keep each machine going on a given diameter for the maximum permissible time, in order to hold set-up changes to a minimum.

The tin-plating operation is performed in an automatic plating conveyor machine built by Frederick B. Stevens. The cycle is so timed as to produce a tin coating ranging from 0.00075 to 0.00125 in. in thickness. The process specification is as follows:

1. Cathodic electric clean—using solution of 50 per cent caustic soda and 50 per cent sal soda in the ratio of 1.5 ounce to 1 gallon of water. The temperature is 175 deg. Fahr.
2. Rinse in cold water.
3. Acid dip in solution of muriatic acid (1 ounce to 1 gallon of water).
4. Rinse in cold water.
5. Neutralize in solution of caustic soda (1 ounce to 1 gallon of water).
6. Tin plate in solution of sodium stannate 7.5 to 9 ounces per gallon of water. Temperature of this solution 175 deg. Fahr. Annodes—steel and tin—(ratio 1 steel to 4 tin). (When plating unit has been idle for a period of several hours 0.5 gallons peroxide must be added before starting unit).
7. Rinse in cold water.

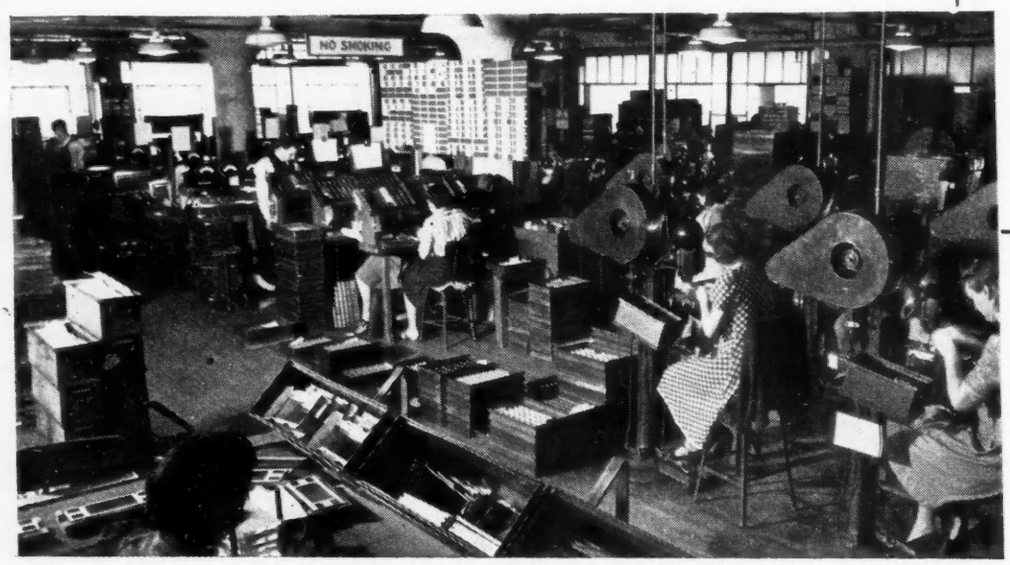
After plating, the pistons are washed and cooled, the ring grooves are burred, and they proceed to the final operations.

To production men, one of the interesting features of the process is the adoption of the National Acme-Gridley chucking machines for the primary machining operations. We believe this marks the first use of these machines for the purpose.



(Circle) Unloading the Stevens plating conveyor. Note the rubber protective devices employed to mask areas which must be free of tin-plate.

General view of one of the batteries of Cincinnati centerless grinders used for grinding the O.D. of both pistons. Note the gravity conveyors feeding one machine, then carrying the work into the other machine of a pair.



Another view of assembly department at King-Seeley, showing sub-assembly operations. A portion of the panel assembly may be seen in the foreground.

A Unit a Second

By Joseph Geschelin

PIONEER in the manufacture of electrically operated panel instruments for passenger cars and trucks and buses, the King-Seeley Corp., Ann Arbor, Mich., is proud of its list of 12 standard equipment accounts including some of the fine names in the automotive industry. It also supplies miscellaneous items to many truck, tractor, and engine builders.

Back in 1922, the company acquired its first standard equipment account which took about five gages a day. By 1929 production had increased to one and a quarter million units. Today production touches about 30,000 units per day.

At the present time, King-Seeley makes some 12 distinct items, listed elsewhere, including the line of Handy governors, Handy oil bath air cleaners, and Handy Oilfiltors acquired when the company absorbed the Handy Governor Corp., late in 1938. Following this merger, King-Seeley built a modern addition to its plant in Ann Arbor, rearranged many of its production departments, now boasts some 125,000 sq. ft. of floor space housing about 1200 employes.

The manufacture of intricate instruments involves the application of unique methods and special equipment quite unlike the familiar techniques current in the automotive industry. Yet the general approach holds much of practical interest to production men and incorporates basic principles that may be profitably applied in many other plants. Consider motion study for example. The application of micro-motion-study has been an invaluable tool in the analysis of sub-

Intimate view of the high speed instrument panel assembly line, with assembly stations and conveyor belts at right angles. The American assembly press may be seen at the right.

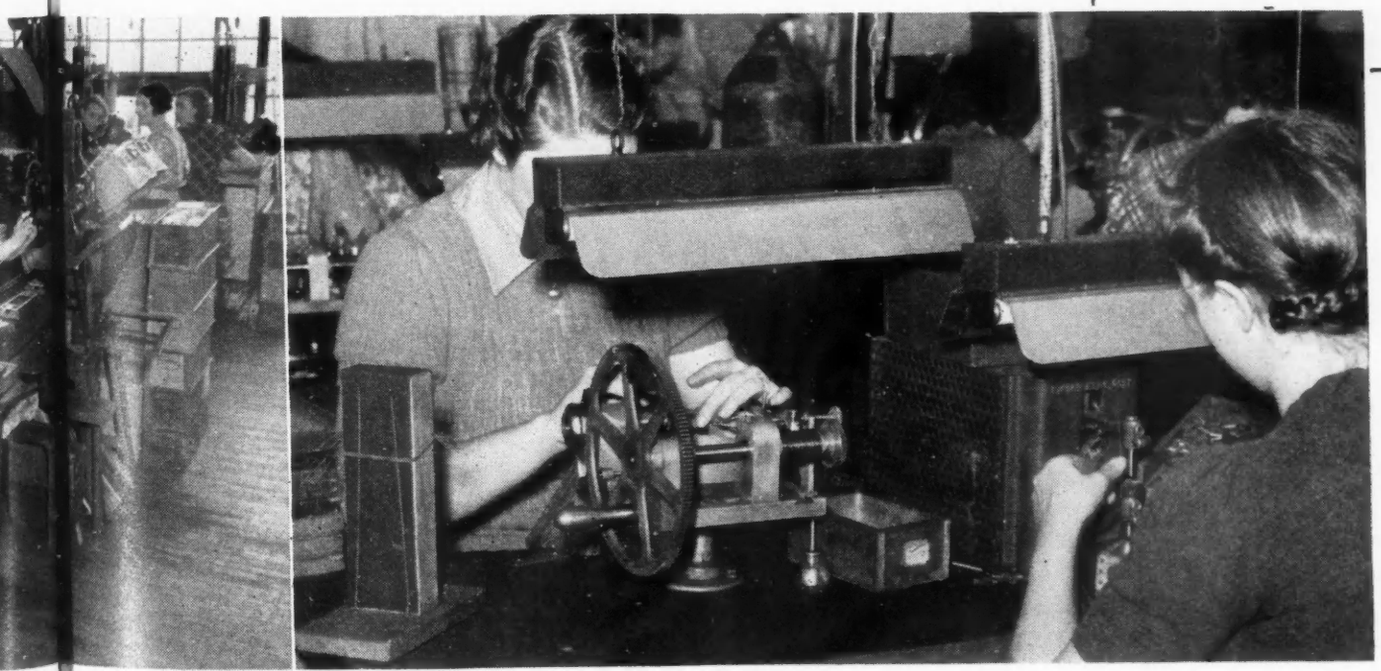
assemblies and assemblies, has provided the most economical solution for the arrangement of work places and assembly stations, and tool layout. Nor are its benefits confined to economy of operation. As a matter of fact, motion study has simplified the exacting tasks imposed on operators by highly repetitive operations, resulting in the reduction of fatigue and the improvement of working conditions.

Some of the illustrations in this article provide a sampling of typical motion study operations, emphasizing the layout of convenient work-places, the positioning of component small parts to expedite assembly operations, the arrangement of materials handling devices and conveyors.

Materials handling, which is a basic consideration in any modern production activity, has been skillfully organized to achieve a smooth flow of raw materials and finished parts. The flow of materials has been integrated by the adoption of a standard tote box unit used in every corner of the plant. An interesting detail connoting the emphasis upon quality is found in the handling of plated parts.

One corner of the comprehensive laboratory facilities provided and below is a close-up of the bimetal coil winding operation (left) followed by welding of the fine wire terminal at the right on the Eisler welding machine with split-cycle timer control.

at King-Seeley



PRODUCTION

Contact points are inspected 100 per cent for riveting and surface finish under microscope, as shown.

These parts are transported to the plating departments in the standard tote boxes, and in the initial washing operation both the work and tote boxes are thoroughly washed. Consequently, when nicely plated work is ready for delivery to assembly stations, it is transported in spotlessly clean tote boxes, free of dirt or oil.

Press shop management, too, has had the benefit of excellent procedures coupled with motion study and embodies certain principles which are of general interest. For example, every press work-station is so arranged as to have the blanks within easy reach of the operator, using the standard tote box container. Each machine is equipped with a standard safety device to eliminate hazards. Wherever practicable, the work is ejected from the die by air blast and is dropped through a chute into a tote pan on the floor. Every effort is made to relieve the operator of the task of loading and unloading the die.

Many items of new equipment in production departments and in the tool rooms bear witness to the effectiveness of the current modernization program. This is evident in the examples selected for the pictorial section.

It is of interest at this point to mention briefly the impressive laboratory and research facilities found in this plant. Naturally the fundamental and commercial research program is vital to any progressive parts producer. It is, indeed, an index of his ability to serve the industry and his own customers. A visit to Ann Arbor will reveal that the extent of such facilities is rather impressive for a plant of this size.

Here will be found chemical laboratories; a metallurgical laboratory; electric testing including facilities for the development of instrumentation and quality controls used in production as well as for the development of new or improved

List of King-Seeley Products

Gasoline gages
Oil pressure gages
Temperature gages
Ammeters
Voltmeters — Battery Condition Indicators
Speedometers
Instrument panel assemblies
Oil filters
Air cleaners
Governors, velocity type
Governors, mechanical drive
Electric fuel pumps

Close-up of work station of a Chicago riveting machine used for small sub-assemblies. This illustrates the arrangement of work place and component parts storage bins based on motion study.

ucts; life testing booths; and a fine dynamometer room with facilities for testing engine governors as well as instruments.

Distinction is made between tool room facilities for production and for experimental purposes. Thus we find that the engineering department has its own model shop, a fine tool room equipped with the latest type of machinery for making experimental tools and engineering samples.

Coming now to the production departments, we note that the entire operation begins with the receiving department, where all materials are subjected to strict quality control by the receiving inspection.

Instrument and gage manufacture is simplified and expedited by coordination of engineering design and production methods. Because the entire line of instruments is based upon electrical elements, all devices, regardless of their function, utilize the same standard and interchangeable basic units. This reduces the number of elements required, simplifies assembly, simplifies materials handling.

Carrying this principle to its logical conclusion, the functions of the fabricating and assembly departments are divided into two distinct categories—"receiver," or indicating panel instruments, and the "sender," or remotely mounted actuating devices.

The set-up of production divisions is quite simple and may be broken down into the following departments:

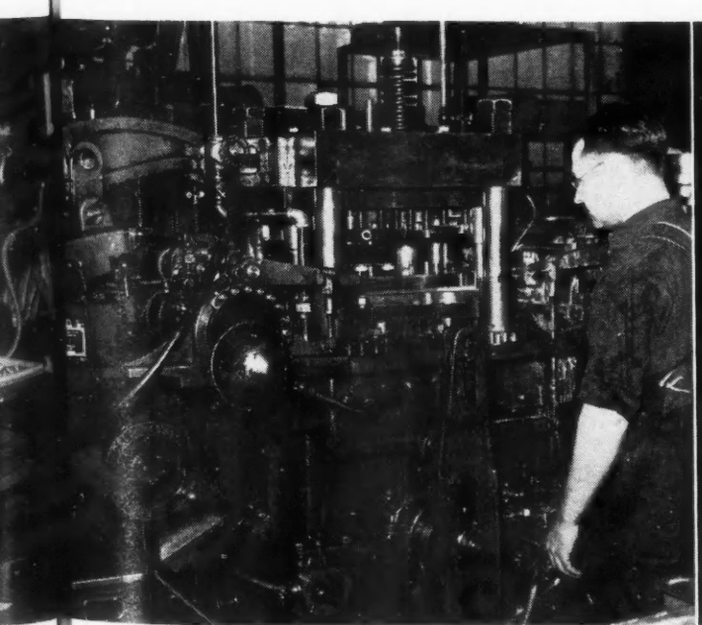
Fabricating Departments		Assembly Departments	
Press Room	Plating	Sender	Air Cleaner
Screw Machine	Finishing	Receiver	Governor
Machine Shops		Panel	Speedometer
		Fuel Pump	Service

Receiver Department

This houses in self-contained form practically all

Factory Routing Oil Pressure Receiver Components

Part	OPERATION	EQUIPMENT
Terminal Screw	Head Roll Slot Wash	Cold header Thread roller Fixture Hobart washer
Terminal plate	Cut, notch, pierce	No. 1½ Bliss press
Case	Blank, draw, strike, pierce and lance Zinc plate	50-ton Henry & Wright press Barrel
Bimetal bracket	Blank, pierce and form Cadmium plate	No. 645 Bliss press Barrel
Bimetal	Blank and pierce	No. 645 Bliss press
Rivet ⅛	Head Nickel plate	Cold header Tumbler
Washer	Blank and pierce Cadmium plate	No. 1½ Bliss press Tumbler
Calibrating spring bracket	Blank, pierce and form Cadmium plate	No. 645 Bliss press Barrel
Calibrating spring	Blank and pierce Clean	No. 1½ Bliss press Rex degreaser
Washer	Blank, and pierce Tumble Cadmium plate	No. 645 Bliss press Tumbler Tumbler
Pointer	Clean Paint Clean fixture Fill gun Wrap Blank and pierce	Bench Spray booth Bench Bench Bench No. 1 Styles press
Backplate	Blank, emboss, pierce and lance Zinc plate	No. 645 Bliss press Barrel



In the center picture is a big Henry & Wright dieing machine for progressive die work. Note the tote pan on the floor at the left, fed by the chute outlet from the die station. Below is a close-up of one of the calibration units for final setting of temperature instruments (sender element).

Factory Routing Standard Panel Components

Part	OPERATION	EQUIPMENT
Bezel	Cut and draw	No. 6 Bliss press
	Wash	Tank
	Draw	No. 5A Toledo press
	Pierce	No. 5A Toledo press
	Form	No. 304½ Bliss press
	Trim	No. 5A Toledo press
	Rough buff	Hammond lathe
	Clean	Hobart Washer
	Color buff	Hammond lathe
	Bright chrome plate	Tank
	Inspect	Bench
Panel Case	Blank and draw	No. 6 Bliss press
	Redraw	No. 304½ Bliss press
	Trim	No. 5A Toledo press
	Pierce	No. 5A Toledo press
	Lance	No. 4 Bliss press
	Zinc plate	Tank
	Paint	Spray booth
Panel Backplate	Blank and draw	No. 5A Toledo press
	Pierce	No. 5A Toledo press
	Pierce	No. 5A Toledo press
	Pierce	No. 5A Toledo press
	Trim	No. 5A Toledo press
	Form and extrude	No. 5A Toledo press
	Tap 12 holes	Natco tapper
	Tap 14 holes	Natco tapper
	Zinc plate	Tank
	Board	Bench
	Paint	Spray booth
	Pack	Bench

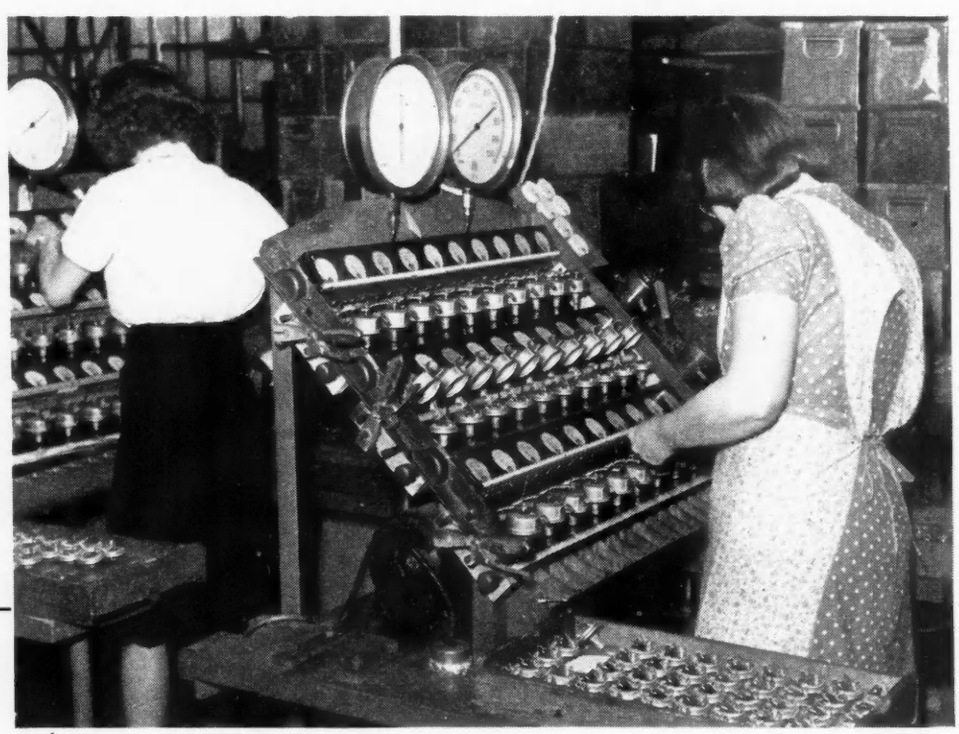
Special Ex-Cell-O machine with rotary indexing table for drilling and reaming gasoline gage bearings. At the extreme right is a close-up of dynamometer testing booth in the research division. This equipment is employed for governor development as well as the testing of various instruments under conditions simulating actual service operation.

of the fabrication and assembly operations for dash-mounted instrument units. Outstanding among the fine fabrication jobs in this department are the ones associated with the manufacture of the operating element—the bi-metal with its delicate winding. Impressive operations are those of winding the coil and the welding of the fine wire terminal. This is accomplished with uncanny speed on a ½ k.w. Eisler electric resistance welding machine fitted with an E-C-M split cycle timer which is the very heart of the operation.

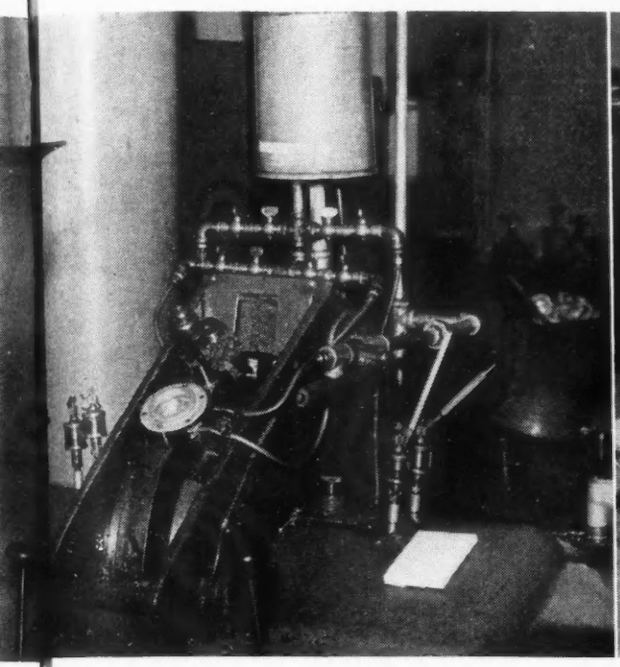
There is, in addition, a complete set-up for the production of various small parts, together with their inspection before transporting to the assembly department.

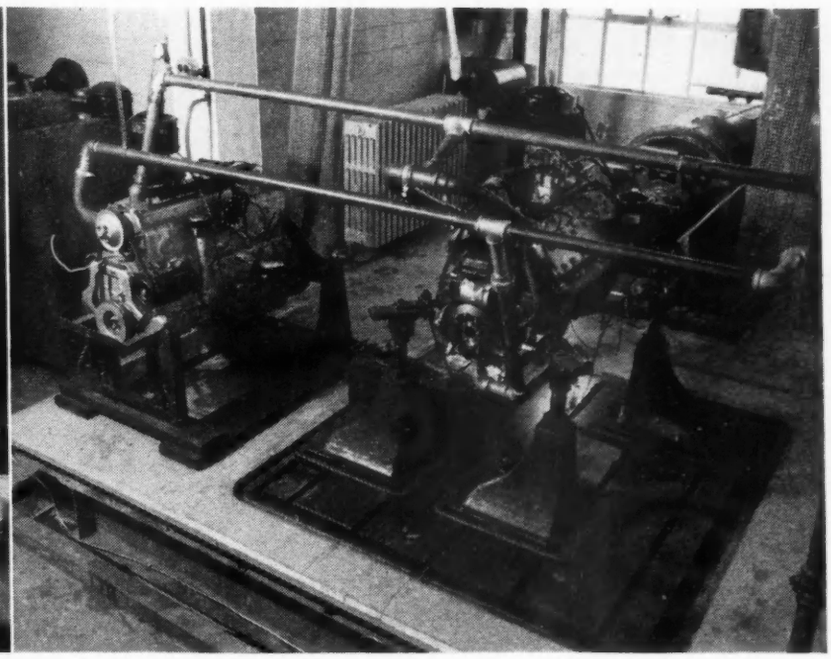
The assembly department has marvelously coordinated lines for producing small sub-assemblies, major sub-assemblies, and final assembly of the units. The initial sub-assembly line consists of a row of three high-speed presses and a parallel row of riveting machines served by suitably stepped belt conveyor line running between. In addition there are a number of lines of automatic Chicago riveting machines for other sub-assembly operations.

The various sub-assemblies move up the first battery of assembly benches where the complete units are built up, and at this stage we find the first differentiation between the units, depending upon the requirements of individual customers. Chief difference is in the pointers and dials, which are alike physically



Part of battery of calibration units for final setting of oil pressure gages.





but vary in finish and color to suit individual orders.

Final step in unit assembly is the fitting of the dial, followed by precise calibration on a battery of double-row calibrating machines. And finally by 100 per cent inspection.

Finished units then are routed to one of two instrument panel assembly lines—the low production line handling the gamut of small lots; the high production panel line for the large volume orders. The low volume line feeds the panels to a belt conveyor which carries them to the packing station.

The mass production line, which is highly mechanized, is L-shaped with the initial stage parallel to the first line. One of its important stages is an American Broach hydraulic press used to secure certain of the fastenings.

In the assembly department there is a separate station for backplate assembly, featuring work benches based upon motion study technique as to placement of component parts, location of tools, etc.

Panel assemblies from both lines are carried on a common belt conveyor to the end of the department for packing. While moving along this conveyor, each unit is subjected to visual inspection. As a further check on quality there is a sampling check procedure in which a certain percentage of finished panels is taken off the line before packing and checked completely as to functioning of each of the instruments in the cluster.

Sender Department

This handles all of the detail of fabrication and assembly of the remote control actuating element of the instrument. In layout, one side takes care of the standard works while the other side handles the final assembly. The latter consists of a double assembly line with a gravity conveyor for connecting the work stations and facilitating the work progress.

Vital part of the sender element is the contact point. It is made of platinum-iridium alloy, is riveted in place, and polished in one setting, using a special diamond die. This operation is checked 100 per cent under microscope by a group of inspectors to assure perfection of surface finish.

Temperature indicating units are assembled in suitable fittings and then are individually calibrated on a battery of four banks of calibrating stations. Each unit is adjusted at two points, in each of two separate stations, one heated to 100 deg. Fahr., the other to 212 deg. Fahr.

Oil pressure gage assembly involves some highly technical processes including the fabrication of the diaphragm, which is the heart of the instrument. After assembly, the instruments are calibrated in special machines, using air pressure. They are adjusted at two positions, one at 5 lb. per sq. in.; the other at 50 lb. per sq. in. Final calibration is achieved by the addition of a suitable shunt in the winding depending upon the initial characteristics of the instrument.

The gasoline gage also is assembled in this department in a separate corner of its own. Here will be found a specially built Ex-Cell-O double end precision machine for drilling and reaming the two bearings. Assembly is followed, as in the other instruments, by calibration.

Miscellaneous Departments

In one corner of the plant is a small department containing a number of metal working machines for numerous special operations. Among these is a battery of four Brown & Sharpe single-spindle automatics. Another group of machines operates continuously on receiver terminals. This comprises a cold heading

(Turn to page 520, please)

MEN and MACHINES.

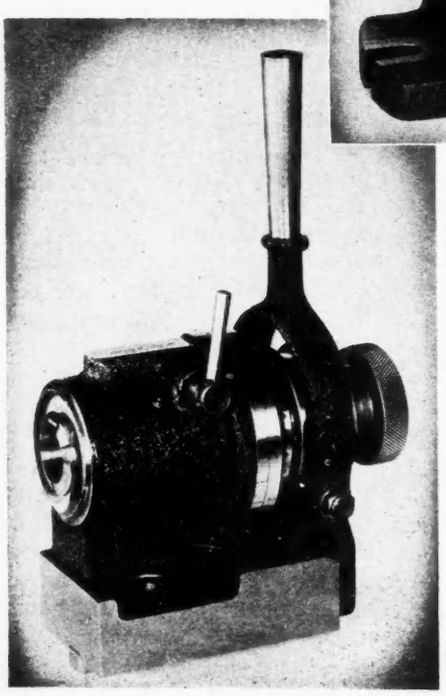
THE long-time trends in machine tool development —those that are entirely apart from the present feverish armament activities—were the object of comment by Bernard Lester, special representative of the Westinghouse Mfg. Co., in an address delivered last month before more than 100 delegates attending the Westinghouse-sponsored fifth annual Machine Tool Electrification Forum. In Mr. Lester's analysis, six main points were evolved.

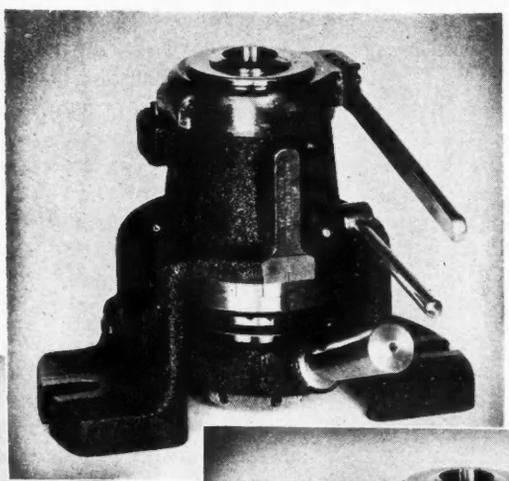
First, in view of the steady shrinkage of the number of hours worked daily by men and machines, resulting in increased cost of the machine operator's time, it is essential that the operating efficiency of the machine itself be increased, especially in reducing the time required for setting-up operations. Secondly, the idea that man should adapt himself to the machine now has been displaced by the ideal of making the machine further adaptable to man. This implies the desirability of further study of the natural and agreeable motions of working men as well as many other factors, such as sight, touch and posture. Machines must be made still more convenient to operate, quiet, free from vibration, and easy to keep clean. For his third point, Mr. Lester observed that eye appeal or the physical appearance of the machine itself will continue to become more of a factor to be desired and, consequently, will be given more and more consideration in purchase and use.

Another trend paralleling the continual redesign of machinery to turn out more work to closer limits with a higher degree of uniformity, the fourth point, will be more complete equipping of machine tools with various types of "tell-tale" or indicating and recording devices which will reveal at a glance just what the machine actually is doing at all times. Fifth, methods of accomplishing adjustable and selective speed reductions and increases, whether electrical or mechanical, or both, will receive much more attention than in times past. Such methods are going to be simplified, made more convenient, reliable, efficient, and the apparatus will take up less space.

The sixth point emphasized the need to recognize the increasing importance of continued study of the size, location, structure and operating characteristics of those elements in a machine tool which produce the power, and simplification of the structures and operating members which translate this power to the exact point in a machine where it is to be put to work.

The foregoing remarks by Mr. Lester were included in his welcoming address which was followed by presentation of 14 technical papers during the three-day forum. Papers and their authors were, as follows: "Adjustable Speed Drives Operating from A.C. Supply," W. I. Bendz, district





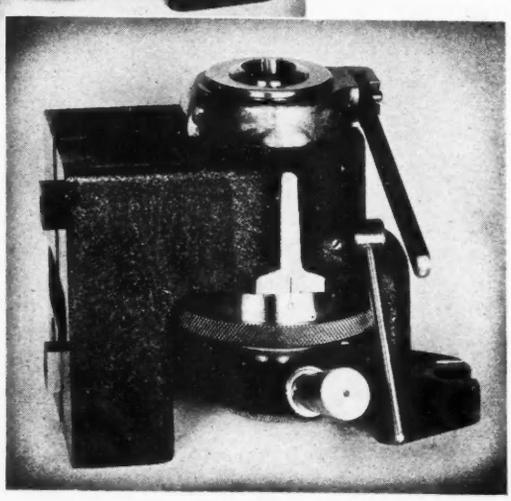
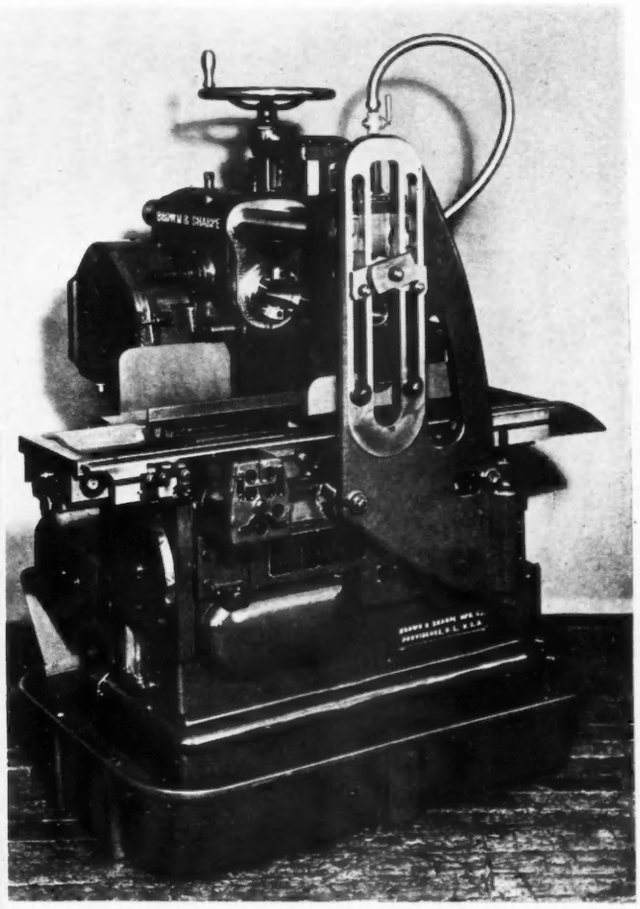
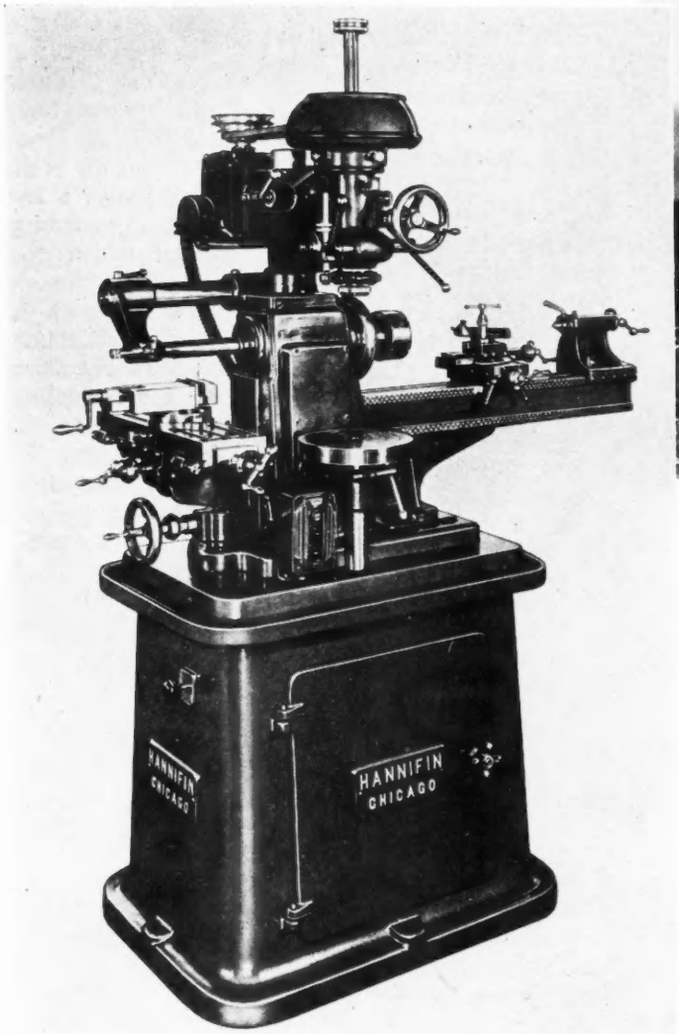


Fig. 1 (Left)—Hardinge horizontal collet index fixture with lever collet closer
Fig. 2 (Top)—Hardinge vertical collet index fixture with lever collet closer
Fig. 3 (Above)—Hardinge combination horizontal and vertical collet index fixture with lever collet closer



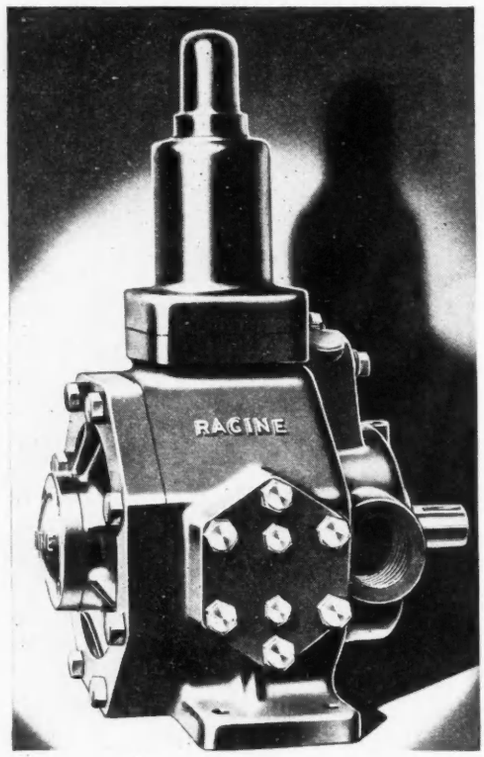
(Above) Brown & Sharpe No. 12 plain milling machine which has been redesigned for increased capacity.

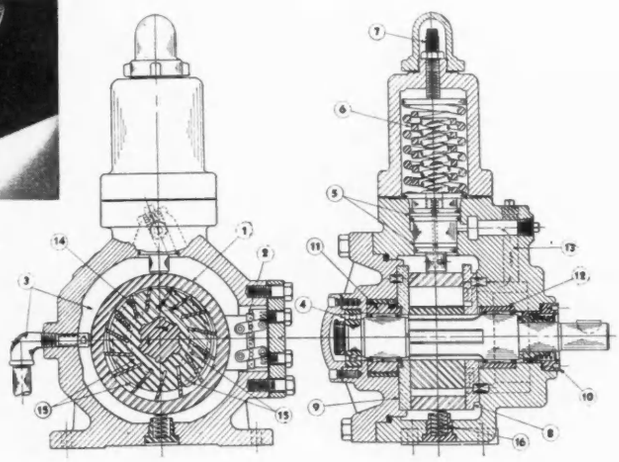
(Below) Hannifin's No. 10 tool room machine with precision lathe, sensitive drill press, horizontal milling machine and vertical milling machine combined in a compact unit.



engineer, Westinghouse, Boston; "Can You Use A Gearmotor?," S. B. Brittain, gearing division, Westinghouse; "Combination of Electrical and Hydraulic Operation on Automatic Broach Grinding Equipment," J. C. Wilson, engineer, Thompson Grinder Co.; "Electric Tachometers," W. M. Moody, meter division, Westinghouse; "Responsibilities of the Electrical Manufacturer to the Machine Tool Industry," C. B. Stainback, manager, industrial sales department, Westinghouse; "'Streamlining' in Electrical Equipment Design," D. L. Hadley, consulting designer, Westinghouse; "Electrical Equipment for a Special Purpose Grinding Machine," R. S. Elberty, electrical engineer, Landis Tool Co.; "Synchro-Tie Transmission," C. W. Drake, manager, general mill and resale section, industry engineering department, Westinghouse; "Training Skilled Workers for Industry," C. D. Moore, supervisor of trades training, Westinghouse; "Improving Your Present Operators," W. K. Bailey, sales manager, Warner & Swasey Co.; "New Dimension Standards for Small Industrial Motors," R. W. Owens, manager, motor division, Westinghouse; "Typical Wiring Arrangements for Basic Control Functions," O. G. Rutemiller, district engineer, Westinghouse, Detroit; "Applying Control Equipment to Machine Tools," D. K. Frost, electrical engineer, Mattison Machine Works, Westinghouse; "Installation and Maintenance of the Electrically Equipped Machine Tool," A. H. Platt, electrical engineer, Bullard Co. Some of these papers will be discussed individually in subsequent installments of *Men and Machines*.

HARDINGE BROTHERS, INC., Elmira, N. Y., has developed three new collet index fixtures: the horizontal collet index fixture with lever collet closer, the vertical collet index fixture with lever collet closer, and





(Above) Racine Tool & Machine Co.'s standard variable volume hydraulic pump with automatic governor control. (Right) Sectional view of Racine pump, and governor for hydraulic control of maximum pressure.

The numbered parts are: 1, pressure chamber ring; 2, needle roller thrust bearing; 3, drain to reservoir—no pressure in pump case; 4, two-directional ball thrust bearing; 5, piston rings seal governor pressure; 6, multiple pressure control springs; 7, pressure adjustment; 8, bronze port plate; 9, bronze side plate; 10, mechanical oil seal assembly; 11, self-aligning needle roller bearings; 12, needle roller bearings; 13, pressure oil to governor; 14, vanes (15); 15, ports for balancing vane pressure; 16, pressure chamber ring centering spring.

the combination horizontal and vertical collet index fixture with lever collet closer shown in Figs. 1, 2 and 3, respectively. These fixtures were developed to permit the serviceability of the Hardinge index fixture to be extended into production departments. They were designed to meet any position requirement or combination of requirements. All fixtures take the same 5C Hardinge 1 in. capacity collet, affording interchangeability. Collet sizes may range in any fractional round hole sizes from 1/64 in. to the capacity of 1 in. Hexagon and square sizes also are available as are special step collets for special applications.

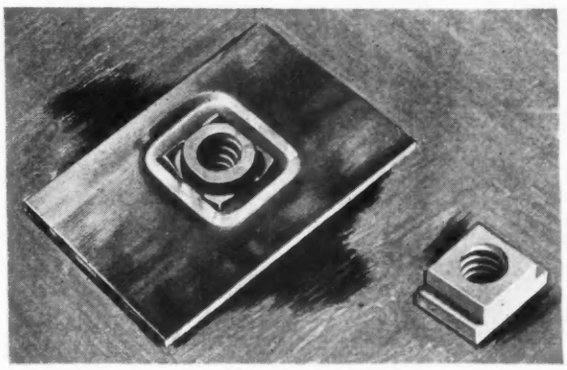
The fixture shown in Fig. 1 makes rapid production possible for parts which must be machined and then indexed for additional machining operations. Moving the lever to the right causes the collet to grip the work properly. Moving the lever to the left opens the collet and assists in ejecting the work. The lever collet closer, states the manufacturer, saves time, reduces wear on the draw spindle and collet threads and assures positive and uniform collet tension. The index plate has 24 holes providing divisions of 2, 3, 4, 6, 8, 12 or 24.

The fixture shown in Fig. 2 also is arranged with lever collet closer for rapid production work. Its index plate has the same number of holes and divisions as the fixture previously described. The spindle has a lever for rapid and convenient positioning of the spindle when indexing. The spindle positioning lever is arranged to drop out of the way after indexing and to take a convenient position to permit the disengaging of the index pin and indexing the spindle to the next position.

The combination fixture shown in Fig. 3 combines in one device the features of the horizontal and vertical types. The production type index plate eliminates the necessity of reading the graduated dial for each indexing of the work. The spindle is provided with a lever indexing arrangement which operates the same as the one with the vertical collet index fixture. The fixture is provided with removable ½ in. wide keys in the base and arranged for bolts for use in the horizontal position. These keys may be replaced with stepped keys for larger sizes of T-slots. The combination fixture is particularly good for production purposes.

ANNOUNCEMENT of a new model variable volume hydraulic pump has been made by the Racine Tool & Machine Co., Racine, Wis. The new models are rated at 1000 lb. continuous pressure and are of the same overall dimensions as the former 500 lb. pumps and are interchangeable in the field. They are used extensively in a wide variety of industries and particularly in clamping and holding operations and in maintaining accurate and constant pressure. Applications include plastic molding and other types of presses, die casting machines, forming machines, welding machines, loading equipment, chucking and clamping, machine feeds of all kinds, pressure testing machines, and core drilling machines.

One feature of the new 1000 lb. pump is a shaft of much larger diameter, providing a wide margin of safety against deflection under maximum load or shock. Needle bearings have been made wider and of larger diameter and a ball thrust bearing has been added to carry any possible end thrust. Oil seals of the mechanical self compensating type, as used in refrigeration compression equipment, prevent leakage at the shaft end and seal against atmospheric pressure only. These are of the revolving type and replace the packing type of seal formerly used.

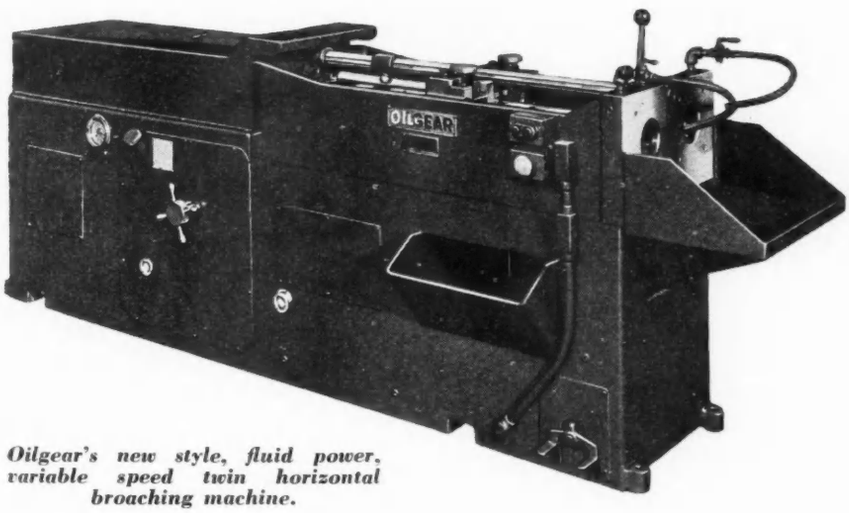


"Fast-On" lock nut which provides a new method of increasing the thread area in sheet metal, making practical the use of lighter gage metals and simplifying assembly in inaccessible places. Made by Fabri-Steel Products, Inc., Detroit, 33 different kinds of Fast-On lock nuts are available in No. 6, 8, 10, 12 and ¼ in., 5/16 in. and ⅜ in. sizes and various thread pitch diameters.

Vanes and rotors in these pumps are heat treated, hardened and ground. The vane slots now are slanted away from the direction of rotation which permits the use of wider vanes having greater strength and allows for a greater thickness of metal between bottom of slots and shaft hole. Further, the slanting of the vanes affords a wider sealing area against interior slippage of oil, reduces possible wear and smooths out the action. The pressure chamber ring is double heat treated, hardened and ground. The manufacturer points out that the accurately ground steel ring imparts a smooth harmonic action to the vanes and prevents gouging and wear.

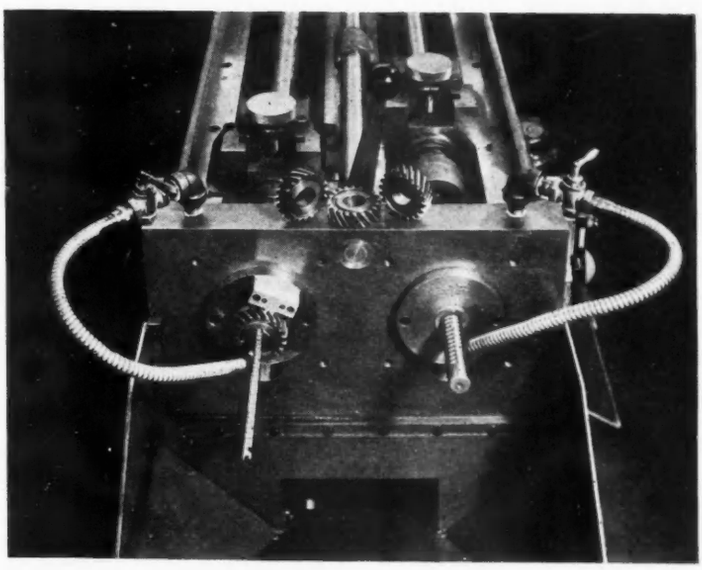
Hydraulic balancing of the vanes now is accomplished by an improved porting of the side plate. The side plates are of hard bronze of special analysis and permit close working and sliding fits without the danger of scoring and seizing.

In addition to the variable volume constant pressure feature, which is obtained by a simple type of hydraulic governor, the pumps also are furnished with manual handwheel for positive control of volume. Another combination consists of a dual pressure control, operated hydraulically or electrically, permitting maximum volume at low pressure, for rapid traverse movements, and minimum volume or deadhead holding at high pressures.



Oilgear's new style, fluid power, variable speed twin horizontal broaching machine.

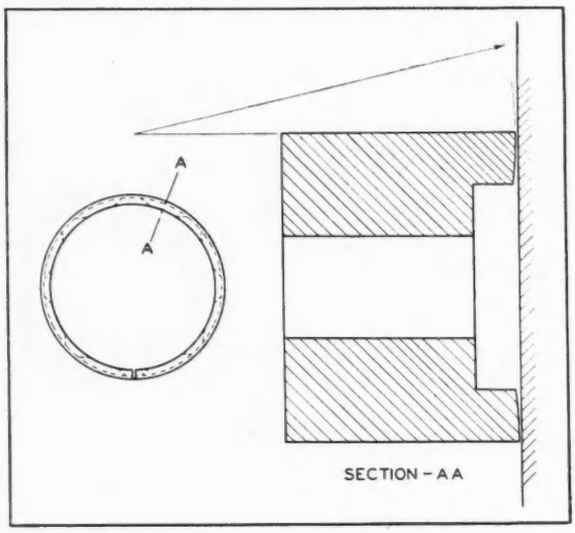
(Right) Broaching of hole and keyway in spiral, L.H., 20-tooth, cast-iron crankshaft gears in sequence on Oilgear "XB-12" twin horizontal broaching machine.



IN THE Hannifin Mfg. Co.'s No. 10 tool room machine the precision lathe, sensitive drill press, horizontal milling machine and vertical milling machine are combined in a compact unit. The lathe is a modern, precision tool room lathe, with rigid lathe bed mounted on a heavy base. The tail stock has ground gibs on all bearing surfaces for take-up in any direction. Spindle is hardened and ground, ball bearing mounted, and is formed to take adapters having B&S No. 10 tapered shank. The compound slide, designed for precision work, has simple, rapid adjustment features and extra strong tool slide. A 4-in., 3-jaw universal chuck is furnished, also a 3-jaw No. 6-A Jacobs chuck (½ in. for the tail stock. The sensitive drill press unit is designed for sustained accuracy and has simple, easily accessible controls for rapid and economical work. The 9-in. adjustable table is mounted on the main machine

(*Turn to page* 540, *please*)

Sealed-Power Oil Control Ring



The drawings, herewith, illustrate a new oil-control ring which is being offered the industry by the Sealed Power Corporation, Muskegon, Mich. The outstanding feature of this new ring is that the lands are turned each to a radius equal in length to nearly twice the radial depth of the ring and whose center lies in the plane of the outer face of the ring. Such a ring naturally has a very narrow contact with the cylinder wall when new, which results in high unit pressure and quick seating. Adjacent to the zone of high unit pressure there is a zone of moderate pressure, which prevents too rapid wear. At the inner edge of each land there is an initial clearance of 0.002 in. A continuous channel of a uniform depth proportional to the radial thickness of the ring ensures substantially uniform pressure around the circumference. The oil-vent slots at the bottom of the channel are made wide to prevent clogging. Turning the lands to a radius, in addition to ensuring a gradual increase in bearing surface of the ring against the cylinder wall, has the effect of providing, during the initial stages of the life of the ring, an oil wedge, which supplies oil continuously to the narrow bearing surfaces and prevents scuffing and undue wear during this period.

A Unit a Second at King-Seeley

(Continued from page 515)

machine for forming and a companion Waterbury Farrel thread rolling machine.

In the current expansion program, King-Seeley has added a number of new items quite distinct from the well-known line of electrically operated instruments. Among these activities is the new speedometer department which is at present operating on an experimental basis. A separate department is being established on an experimental basis for the production of an electric fuel pump.

Acquired from the former Handy Governor organization are newly formed departments for fabricating the line of air cleaners and oil filters, and a separate machine shop for governor parts. In addition, there is a department for governor assembly containing principally a variety of small drill presses as well as special presses built up from standard Delta drill heads.

This plant has complete facilities for plating of every description, including cadmium, bright zinc, bright nickel, and chromium.

One corner of the plating department is completely mechanized for handling instrument panels. There is an ingenious machine for drying after plating in which the panels are carried on a wire belt conveyor and dried by impinging gas flames. As the panels leave this station they drop down a chute directly to an inspection bench. Chromium-plated parts are inspected under hoods flooded with daylight sources.

Press Shop

The press shop is equipped with presses of a number of well-known makes including Bliss, Toledo, and Henry & Wright, in a variety of sizes, segregated in rows according to size. The department is served by its own die repair shop, located within its confines.

As mentioned earlier, each press station is designed on a common principle based on motion study, containing the following basic elements—a standard tote box located on a shelf at the press bed, convenient to the operator; a standard safety device for the operator; an arrangement for ejecting work from the die; a chute at each press to carry the finished work automatically to a tote box on the floor, at the side of the press.

Automatic roll feed presses are used chiefly for work requiring progressive dies. Each roll feed press is supplied with a Waterbury Farrel power feeder and stock straightener. An item of special equipment is a large Henry & Wright dieing machine also fitted with the feeding reel and roller leveler.

Along one wall of the press shop is a battery of small high-speed presses used for producing instrument pointers by means of ingenious piercing dies. This is an exceptionally fine operation considering the physical size of the delicate pointer.

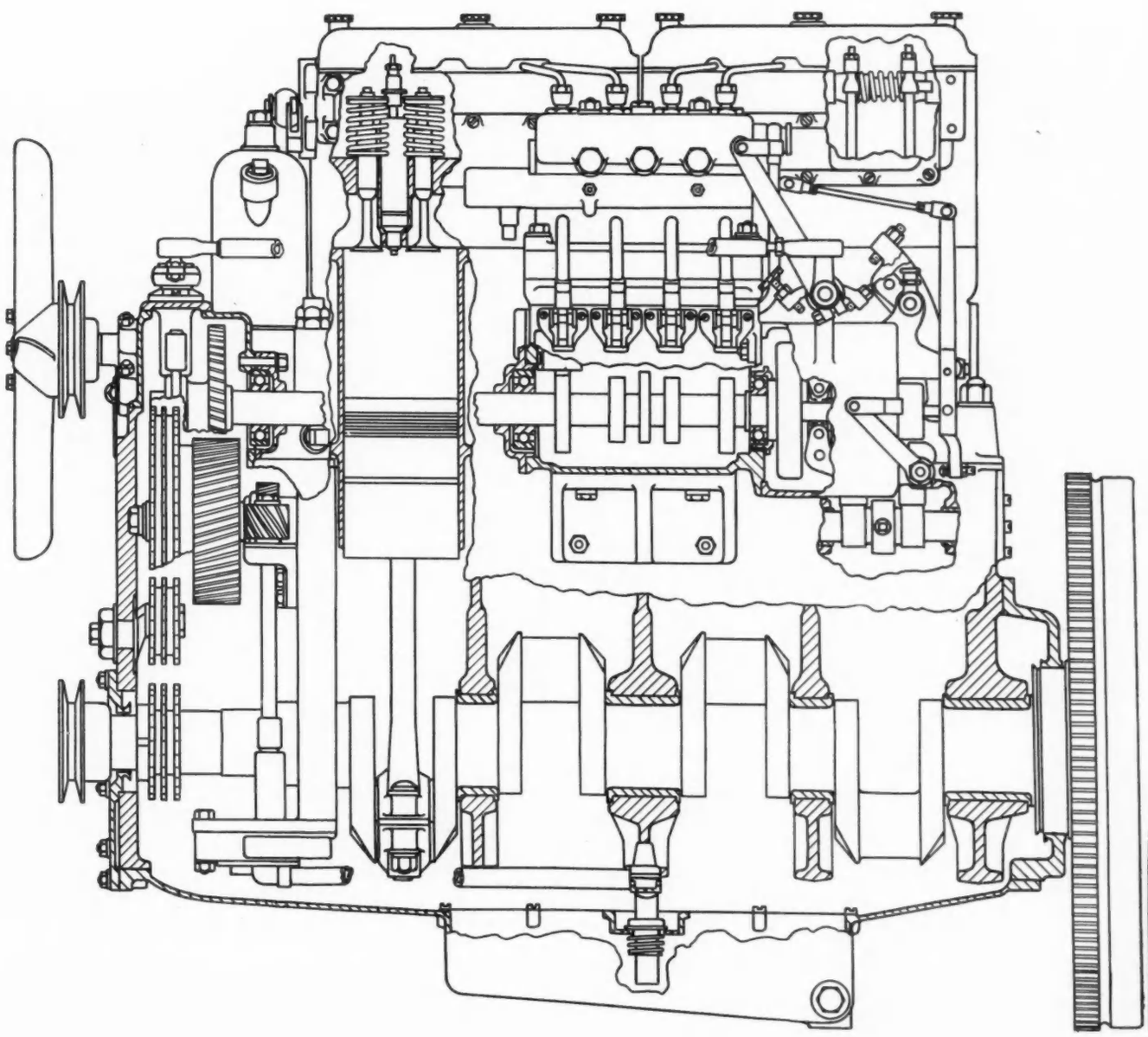
Finally, there is a battery of two small Natco multiple spindle tapping machines used for tapping the panels; and three 35 kw. projection welders.

As an excellent example of good housekeeping, the large presses are arranged to chop up their scrap, which drops down a chute to a scrap conveyor running in a tunnel in the floor, carrying all scrap material to the outside.

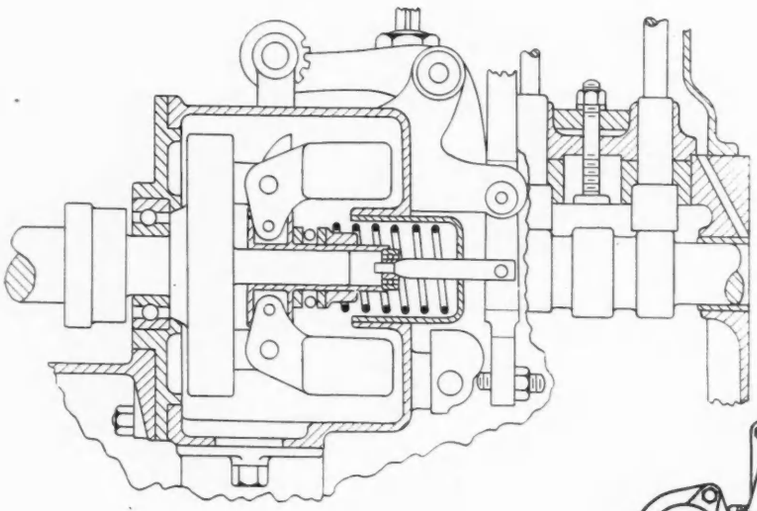
GARDNER FOUR-CYLINDER OIL ENGINE MODEL LK

Gardner oil engines (manufactured by L. Gardner & Sons, Ltd., Patricroft-Manchester, England) are produced in three-, four-, five-, and six-cylinder types. The one illustrated by the sectioned front and side elevations herewith is the four-cylinder LK type of 232 cu. in. displacement. It is a comparatively light power unit, the engine block and cylinder head being cast of aluminum alloy. The specific weight, with flywheel and electrical equipment, is approximately 13 lb. per hp.

Another line of Diesels turned out by the same firm is known as the LW type. This has a bore and stroke of 4½ by 6 in., which makes the piston displacement of the six-cylinder 510.7 cu. in. It has a normal speed range of 400-1700 r.p.m. and develops 102 hp. at 1700 r.p.m. The maximum b.m.e.p. of 103 lb. per sq. in. is developed at 1100 r.p.m. Cylinders in cast iron are separate from the crankcase, which latter can be had in either aluminum or magnesium alloy. Hardened



GARDNER FOUR-CYLINDER OIL ENGINE MODEL LK



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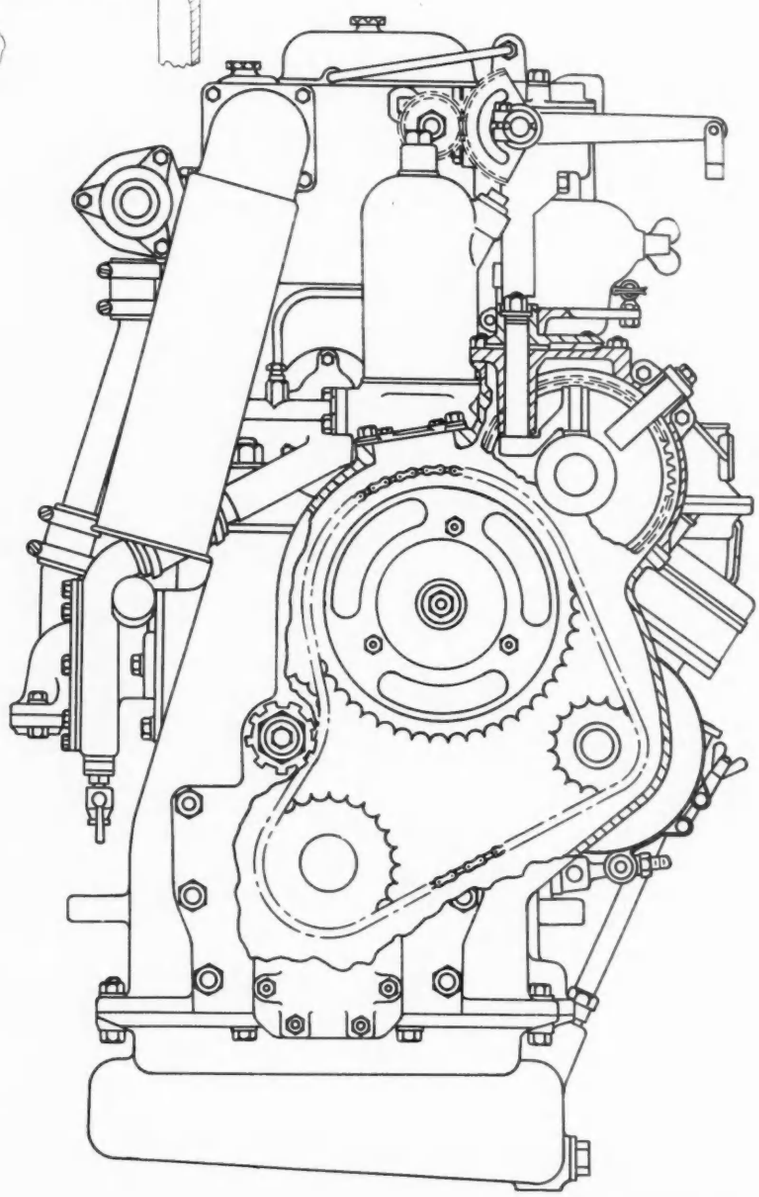


dry liners are fitted.

There is an open combustion space formed in the crown of the pistons, which latter are of aluminum alloy, with four pressure rings and one oil ring each. Injection is direct, by vertical sprayers of the closed-nozzle, multiple-orifice type. The injection pressure is 2500 lb. per sq. in. at 1000 r.p.m., while the compression ratio is 13:1.

Crankshafts of the LW are of nickel steel, with journal bearings of 3¼ in. diameter; the six-cylinder engine has a torsional vibration damper and seven bearings. Connecting rods of steel are rifle-drilled to carry oil to the small ends on hollow floating piston pins.

Camshaft and accessories drive is by triple roller chain with an eccentric idler sprocket and a slotted sprocket on the camshaft for precision timing. The injection pump is a C.A.V.-Bosch with Gardner cam gear. Fuel filters are duplicated, one being permanently in contact with No. 1 cylinder head.

The detail view shows the centrifugal governor used on the LW type of engine. It will be seen that the motion of the centrifugal masses is transmitted to a sliding sleeve by means of a small ball bearing, and form the sleeve to the governor rod by another ball bearing.

AUTOMOTIVE INDUSTRIES

Just among Ourselves

M is for Mobilization . .

ON MAY 16, President Roosevelt delivered to Congress his national defense message calling for unprecedented immediate expenditures on armament, and an accelerated defense program which would change the character of the nation from a residual democracy, to a totalitarian-state-in-waiting. A few voices, like Colonel Lindbergh's have been raised against relapsing into national hysteria. Most of the other voices raised have been in the class of "let me be the first to be the general of a civilian army" breed. Cities, particularly on the eastern seaboard, have "discovered" they are defenseless.

Anything which might be written about the course that world events might take within the next few days, or the next few weeks, would be obsolete by the time this is read. Whatever course they do take will leave us the hard choice of how far we must relinquish our cherished everyday pursuits in order to confront the Strong Men of Europe and the Strong Men of Asia with a nation prepared to battle for whatever is left that seems worthwhile fighting for.

In the years since World War I, governmental authority in the United States has been writing an "Industrial Mobilization Plan," and enacting supplementary legislation to remove some of the obstacles to its effective promulgation. This plan, in its latest (1939) revision, is a printed document of 18 pages, which can be obtained from the Government Printing Office. A commentary on it titled "Mobilizing Civilian America" by Harold J. Tobin and Percy W. Bidwell, has just been published by the Council on Foreign Relations, New York.

Whatever else may claim your time in the immediate future, it would seem urgently desirable to familiarize yourself with the mechanism of industrial preparedness.

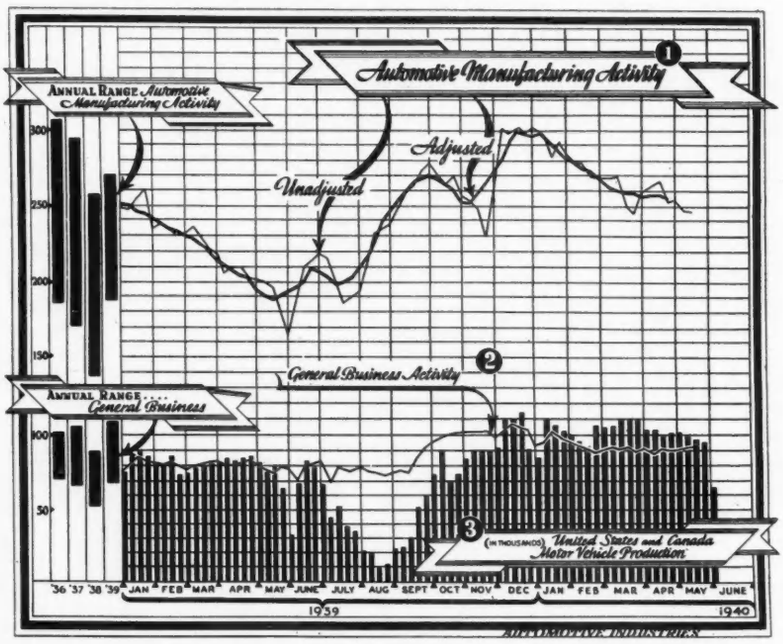
"The highest and best form of efficiency is the spontaneous cooperation of a free people," according to the late Woodrow Wilson.

Education of a free people in the things on which their cooperation may be necessary will certainly remove the cause of a great deal of the blundering which may accompany the "spontaneous cooperation of a free people" which doesn't know what is expected of it.

HERBERT HOSKING

BUSINESS IN BRIEF

Our own view of automotive production and sales; authoritative interpretation of general conditions



Weekly indexes of automotive general business charted

Seasonal Decline Slows Production

PRODUCTION of motor cars and trucks showed the usual seasonal decline during May, but despite the downward trend it remained over the 400,000-mark for the sixth successive month. Output for the month was estimated[3] at 410,000 vehicles, even though the Memorial Day holiday, coming on a Thursday, cut two days from the manufacturing schedules at most plants. Although the smallest production for any month of 1940, May's total was 30 per cent greater than the 1939 figure of 313,214 units for the month. It brought the year's total for the first five months to approximately 2,174,000 vehicles. Output for the week ending May 25 was estimated at 95,500 units, but the succeeding week was expected to show a drop, with the output not likely to exceed 65,000 units.

General Motors output continued to hold steady at a high level, with most of its automotive divisions still operating on a five-day basis. For the week ending May 25, production was estimated at 43,700 units, Chevrolet being the pace-setter as it produced its 800,000th 1940 model car in the middle of the month. Chrysler and Ford trimmed their output to four days, the former turning out 19,000 units for the week, and the latter producing 18,500. Studebaker continued to head the independents, followed by Packard, Hudson, Nash, Willys and Graham. Reo resumed production in the truck field after a lapse of more than a year due to reorganization.

Production for April exceeded even optimistic estimates, the Department of Commerce official figure being 452,433 vehicles for the month. This is the peak month to date in 1940, surpassing even January's total of 449,314.

Domestic retail sales for April were 410,921 units, according to estimate of the Automobile Manufacturers Association. This is the largest sales total for any month since July, 1937, when 427,453 motor cars and trucks were retailed. Passenger car sales for 1940 are running 31.3 per cent ahead of 1939, and truck sales are 22.3 per cent above the previous year. April sales were 31.9 per cent higher than April, 1939.

General Motors April domestic retail sales totaled 183,481 units, 38 per cent ahead of the same month in 1939. Retail deliveries for the first four months were 602,789 units, a gain of 26 per cent.

Studebaker set an all-time record for used car sales in a single month during April of 23,704 units, 69 per cent above April, 1940. Pontiac used car sales of 15,962 units for the first 10 days of May were the largest for a 10-day period in the history of the company. Other companies reported a good turnover of their used cars.

AUTOMOTIVE MANUFACTURING ACTIVITY as indicated by the unadjusted index curve plotted in the accompanying chart, sought the lower levels of 254, 247 and 246 in the weeks ended May 4, May 11 and May 18, respectively. The adjusted curve continued to ease off very gradually, passing through the index levels of 257, 257 and 255 during the weeks ended April 13, 20 and 27, respectively.

[1] 1923 average = 100; [2] Prepared by Administrative and Research Corp. New York. 1926 = 100; [3] Estimated at the Detroit office of AUTOMOTIVE INDUSTRIES.

BUSINESS ACTIVITY

Free Enterprise for U. S. Business Hailed As Key To Strong Defense

Stressed By Speakers Who Discussed Vital Problems Of The Nation At Meeting Of National Industrial Conference Board

Free enterprise for American business, although seriously infringed and disrupted during recent years by government, is the nation's only hope in warding off the growing catastrophe which has engulfed Europe, according to speakers who presented vital problems of the nation May 22 at the twenty-fourth annual meeting of the National Industrial Conference Board.

Encouragement of American business, both small and large, will do more than anything else to strengthen America against foreign aggression; only by buttressing the foundations of all business can the nation hope to develop the strength needed to counter the forces of war, most of the speakers agreed at the several forums during the day.

Highlights of the speeches included such statements as these:

"America has grown great only because we have kept individual enterprise free"—Senator Joseph C. O'Mahoney, of Wyoming, chairman of the Temporary Economic Committee.

"The future—today, tomorrow, and beyond—demands the coordinated effort of the most experienced and intelligent among us. We need the firm conviction that economic truth, crushed to the earth, will rise again. We cannot succeed through partisan effort. We must not fail."—Alfred P. Sloan, Jr., chairman, General Motors Corp.

Charging that New Deal policies had sapped the strength of industry and lulled Americans into the belief that we, as a nation, were secure, Dr. Virgil Jordan, president of the Conference Board, declared that wars are made by government, but are won and lost by men and management. "America's only resource in these dark days," he said, "is the unhampered spirit and capacity of professional management and leadership of American free enterprise. Though this has been gravely impaired during the past seven years of governmental terrorism and bureaucratic blitzkrieg, it remains our key defense."

"Business demands a larger part in solving national problems in this great emergency," William L. Batt, president of SKF Industries, Inc., declared. He pointed out that during the "dark 'thirties, when men were out of jobs, had used up their savings, and were dispossessed of their homes, it was natural for them to listen to and to believe the fantastic promises of politicians.

"Today American business must show the man in the street that business leadership can and will save America for the future."

Furthermore, he pointed out, when government moves in, it tends to stay in business.

"As we get nearer to the war, the

(*Turn to page* 528, *please*)

The Brass-Hat Rack

"I don't think it's wise, sir, to stand in the doorway when the five o'clock whistle blows!"

Reo Motors Resumes Truck Production

Reo Motors, Inc., resumed production after a lapse of more than a year when the first truck of the new series rolled off the assembly line May 21 in the Lansing plant.

The company expects to turn out 35 trucks per day and will have a payroll of 900 employes. There is a substantial bank of orders to be filled for the more than 700 distributors in this country and abroad. Reo negotiated a $2,000,000 RFC loan last March to enable the resumption of production after an extensive reorganization.

William R. Mitchell

William R. Mitchell, executive vice-president of the National Acme Co., died on May 8 after an illness of four months.

Private Carriers Go Under ICC Jurisdiction On Aug. 1

Commission Requests Increased Appropriation For Handling Of Safety and Hours of Service Reports

Placing private motor trucks engaged in interstate commerce under federal control in a decision handed down May 8, the Interstate Commerce Commission will request Congress for larger appropriations in order to increase its staff to supervise the necessary regulations, which become effective Aug. 1. The Commission said that because of the magnitude of the task involved in prescribing safety and hours of service, the present staff "must be increased and this cannot be done under the present budget." It was stated that if Congress appropriates additional funds the Commission would immediately issue a supplemental order requiring private carriers to file reports connected with safety and hours of service. Meanwhile private carriers are exempted from making these reports.

The decision provides general but not complete exemption for farm trucks and also grants certain exemptions to driver salesmen. Aside from a few exemptions and modifications it applies to other private trucks most of the safety regulations regarding hours and qualifications of drivers and equipment which previously were applied to common and contract motor carriers. Two days after the decision was made public, Col. Philip Fleming of the Department of Labor's Wage-Hour division announced that the Commission's order will exempt drivers of private trucks from the provisions of the Fair Labor Standards act. That act sets 42-hr. as the maximum work-week, with time and a half pay for overtime in contrast with the 60-hr. maximum week generally prescribed by the Commission for truck drivers, except that a 50-hr. maximum was set for farm truck drivers, who do not have to meet the age qualifications of other drivers.

The order permits individuals between ages of 18 and 21 to drive a farm truck not in excess of two tons in contrast with general prohibition against anyone under 21 from driving a truck in interstate commerce.

Drivers of farm trucks are not required to get physical examinations. They must, however, have minimum qualifications regarding physical and mental condition.

Farmers are permitted to transport family and employees.

Hours of service regulation prescribed for drivers of farm trucks are to be the same as those prescribed for drivers of trucks operated by common and contract carriers except that (1) the on-duty should not be made applicable to drivers of farm trucks; (2) the driving rule is amended so as to provide that in no event shall the driver of a farm truck drive or operate more than a total of 50 hr. in any one week.

Farm trucks are not required "at the present time" to keep a driver's log. Commission said it would continue to study the subject and endeavor to develop a record in the form of a log or otherwise which will be suitable for use by operators of farm trucks. When this is done, the Commission said, it will give consideration to the issuance of a supplmental order in this case requiring the maintenance of such a record.

The decision permits driver salesmen of light trucks such as those loaded with bread and other bakery products and milk to be on duty for more than 60 hr. in any one week if such driver salesmen spend more than 50 per cent of their on-duty time in selling and less than 50 per cent in performing such duties as driving, loading and unloading. This was said to be especially true if the driving is limited to a total of 50 hr. per week. The Commission also held that if a driver salesman is permitted to be on-duty for more than 60 hr. per week his actual driving time should be curtailed to a total of 50 hr. in any period of 168 consecutive hours. Exemption from keeping a log was granted where a driver is engaged already in transportation of passengers and property within a municipality or between continguous municipalities. Like exemption was granted to drivers of work trucks such as those used by telephone companies.

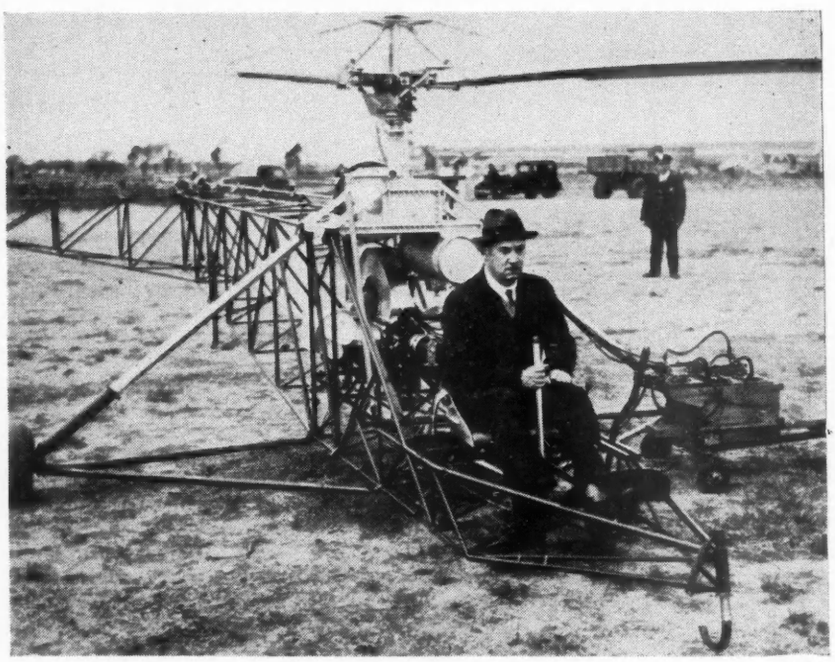
Harwood M. Bacon

Harwood M. Bacon, former general sales manager of the B. F. Goodrich Co., died May 21 at the age of 66 at his home in Cleveland. He was at one time associated with Capt. Edward V. Rickenbacker in the development of pneumatic tires in Los Angeles.

NSPA Automotive Sales Index Up 5% in April

Automotive sales for April, according to the index prepared by the National Standard Parts Association, showed an advance of five per cent over March. It is pointed out by the NSPA, however, that this is 24 per cent ahead of April of last year and that the monthly sales for the first four months of 1940 show an advance of 17 per cent over the same period of 1939.

The NSPA states that shipments of replacement parts to wholesalers in April stepped sharply ahead of March



Acme

Sikorsky's Latest

Believe it or not, this primitive looking aircraft made the first successfully controlled vertical flight at Bridgeport, Conn., on May 20, 1940. With its Russian-born inventor at the controls, the 75 hp. helicopter rose straight up for 30 ft., flew 200 ft. around the field and came straight down. It is equipped with a variable pitch "windmill" rotor. Two small rotors in the rear of the fuselage act as elevators and a third serves as a rudder.

by 10 per cent. This places April this year 27 per cent ahead of last April. Average monthly sales for the first four months of 1940 are 20 per cent above the first four months of last year.

Shop equipment and tools shipped to wholesalers in April also increased eight per cent above March. This places April 23 per cent above last April. Average monthly sales for the first four months of this year are 18 per cent above the same period for 1939.

Original equipment shipped to vehicle manufacturers in April showed an advance of eight per cent instead of the usual decline. This places April 43 per cent ahead of last April. Average monthly sales for the first four months of 1940 now stand 12 per cent ahead of the same period of last year.

Export shipments in April also advanced six per cent above March, bringing April to a point three per cent above last year. Average monthly export shipments for this year are three per cent ahead of the average for the first four months of last year.

Auburn Company Files Incorporation Papers

Articles of incorporation were filed May 14 by the Auburn Central Mfg. Co., with the Indiana secretary of state, as a further step in the reorganization of the Auburn Automobile Co. At the same time the company was authorized to issue 25,000 shares of preferred stock at $50 per share and 500,000 shares of common stock of no par value. The reorganization of the company has been approved by Federal Judge Thomas W. Slick, Northern Indiana district under Section 77-B of the Federal Bankruptcy Act.

April Rim Inspections Gain 35% Over Year Ago

The total number of rims inspected and approved by the Tire & Rim Association during April is reported at 1,822,-686, an increase of approximately 35 per cent over April 1939. During the first four months of 1940, the Association inspected and approved a total of 7,755,024 rims, an increase of nearly 25 per cent over the similar period of 1939.

New Car Registrations 20% Pre-War Figure in England

Registrations of new cars in England during March amounted to only 16.8 per cent of the total of the same month last year. In February they represented 16.4 per cent of the February 1939 figure.

For the first seven months after the outbreak of war the total was only 34,-174, which is 5090 less than figure applying to March alone last year, and just 20 per cent of the registrations during the same seven months of 1938-39.

Estimated Dealer Stocks of New Passenger Cars

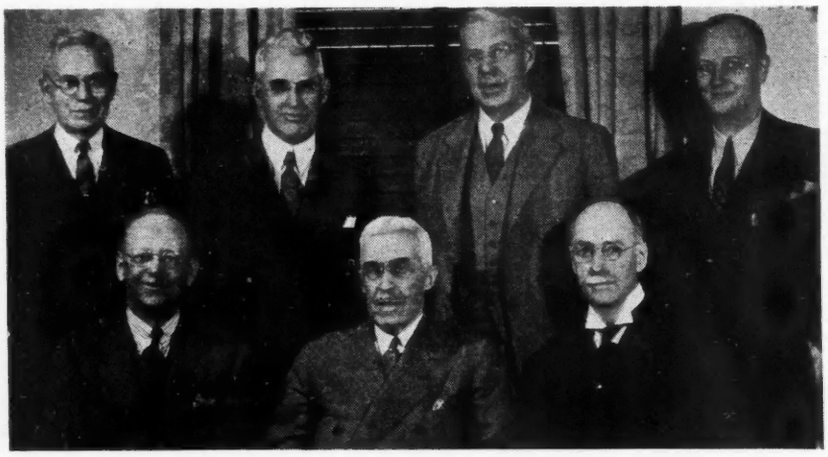
CERTAIN changes have been made recently in some of those data which are used to calculate dealer stocks of new passenger cars. In view of these changes it seemed advisable to recalculate our estimate of dealer stocks from Jan. 1, 1937, to date. These revisions on a monthly basis are of a minor character and result in a decline of approximately 5 per cent in our estimate of stocks as of May 1, 1940.

As of May 1, 1940, dealer stocks of new passenger cars were higher than for any month with the exception of April of this year since Jan. 1, 1937, when these estimates were started. However, it should be borne in mind that while retail sales for February and March of this year were 43 and 22 per cent ahead of last year, at the same time dealer stocks only showed a gain of approximately 9 per cent. With the present tapering off in production along with the maintenance of a good rate of increase in retail sales over a year ago, stocks should soon be down to a normal level.

		1937	1938	1939	1940
Jan.	Production—U. S. Domestic Market †	285,749	130,273	262,330	348,755
	Retail Sales—U. S. ‡	251,387	126,442	180,692	239,509
	Change in Inventory	+ 34,362	+ 3,831	+ 81,638	+109,246
	Inventory, First of Month	248,200	383,805	237,393	215,856
Feb.	Production—U. S. Domestic Market †	276,469	119,896	223,795	324,555
	Retail Sales—U. S. ‡	218,381	120,254	165,865	236,857
	Change in Inventory	+ 58,088	— 358	+ 57,930	+ 87,698
	Inventory, First of Month	282,562	387,636	319,031	325,102
Mar.	Production—U. S. Domestic Market †	376,245	153,316	279,148	341,634
	Retail Sales—U. S. ‡	411,589	188,325	276,364	338,153
	Change in Inventory	— 35,344	— 35,009	+ 2,784	+ 3,481
	Inventory, First of Month	340,650	387,278	376,961	412,800
April	Production—U. S. Domestic Market †	410,592	160,028	257,058	351,814
	Retail Sales—U. S. ‡	390,744	193,392	265,992	352,966
	Change in Inventory	+ 19,848	— 33,364	— 8,934	— 1,152
	Inventory, First of Month	305,306	352,269	379,745	416,281
May	Production—U. S. Domestic Market †	400,415	140,239	222,909	.....
	Retail Sales—U. S. ‡	410,348	187,526	276,719	.....
	Change in Inventory	— 9,933	— 47,287	— 53,810	.....
	Inventory, First of Month	325,154	318,905	370,811	415,129
June	Production—U. S. Domestic Market †	387,121	123,333	233,311	.....
	Retail Sales—U. S. ‡	367,456	156,029	254,604	.....
	Change in Inventory	+ 19,665	— 32,696	— 21,293	.....
	Inventory, First of Month	315,221	271,618	317,001	.....
July	Production—U. S. Domestic Market †	341,189	96,975	142,346	.....
	Retail Sales—U. S. ‡	349,387	153,426	229,873	.....
	Change in Inventory	— 8,198	— 56,451	87,527	.....
	Inventory, First of Month	334,886	238,922	295,708	.....
Aug.	Production—U. S. Domestic Market †	299,496	53,955	56,245	.....
	Retail Sales—U. S. ‡	312,451	123,711	166,172	.....
	Change in Inventory	— 12,955	— 69,756	—109,927	.....
	Inventory, First of Month	326,688	182,471	208,181	.....
Sept.	Production—U. S. Domestic Market †	110,122	60,177	155,430	.....
	Retail Sales—U. S. ‡	194,703	90,629	139,222	.....
	Change in Inventory	— 84,581	— 30,452	+ 16,208	.....
	Inventory, First of Month	313,733	112,715	98,254	.....
Oct.	Production—U. S. Domestic Market †	273,753	171,371	239,150	.....
	Retail Sales—U. S. ‡	213,963	134,984	236,584	.....
	Change in Inventory	+ 59,790	+ 36,387	+ 2,566	.....
	Inventory, First of Month	229,152	82,263	114,462	.....
Nov.	Production—U. S. Domestic Market †	269,580	295,366	272,747	.....
	Retail Sales—U. S. ‡	213,762	241,009	257,398	.....
	Change in Inventory	+ 55,818	+ 54,357	+ 15,349	.....
	Inventory, First of Month	288,942	118,650	117,028	.....
Dec.	Production—U. S. Domestic Market †	212,655	306,009	357,712	.....
	Retail Sales—U. S. ‡	173,610	241,623	274,233	.....
	Change in Inventory	+ 39,045	+ 64,386	+ 83,479	.....
	Inventory, First of Month	344,760	173,007	132,377	.....

† U. S. Census Bureau.

‡ Automobile Manufacturers Association.



Automobile Old Timers

Here are the officers and executive committee of the Automobile Old Timers, a group organized Oct. 18, 1939. Membership qualifications require association in the motor vehicle sphere for at least 25 years. The men are: front row, left to right, George Conrad Diehl, first vice-president; William H. Hotchkiss, president; Dave Hennen Morris, honorary president; back row, left to right, Elmer Thompson, treasurer; David Beecroft, second vice-president; Charles B. King, third vice-president; Frederick H. Elliott, secretary.

Automotive Industries

Summary of Automotive Production Activity

BUSES Gradual increases in production are reported. One of the large manufacturers states that orders being received are substantially ahead of output rate and that the volume of orders is considerably ahead of last year.

TRUCKS The one-word picture of production activity in this field is "excellent." Large fleets appear to be buying very heavily. A report from the East says that deliveries continue to hold up better than was expected earlier in the year.

TRACTORS While sales continue good the opinion is expressed in some quarters that the European situation may change the picture. All of the major companies are ahead of last year on production with some of the makers having difficulty in keeping up with the inflow of orders on new models.

AUTOMOBILES Despite the usual seasonal decline during May, production in this month totaled an estimated 410,000 motor cars and trucks. This brings the year's total for the first five months to approximately 2,174,000 vehicles.

MARINE ENGINES Output is near capacity in several plants and all makers report good business. One producer, presently busy on both marine and other types of engines, is said to be tooling up for a new aircraft Diesel.

AIRCRAFT ENGINES Production continues on high levels with every prospect of increasingly large backlogs of orders in the near future as the government's rearmament program gets underway.

This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.

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Free Enterprise

(*Continued from page* 525)

long arm of government will become longer and extend further into business enterprise. Thus free enterprise will face a real danger, because the only alternative to initiative and freedom of enterprise is the bungling regulation of government."

During the day more than a score of leading business executives and government executives discussed "Stimulation of Investment," and "Improvement of Employer - Employee Relations." In both round-table conferences the encroachment of government was paramount in the minds of speakers and audiences.

Dr. William M. Leiserson, a member of the National Labor Relations Board, urged management to look upon labor relations as a "family problem, rather than as an economic one." The real troubles, he predicted, are yet to come, when industry and labor find themselves living together in a new relationship—"just as the real problems in all of our lives come after marriage."

"Government prefers not to interfere, but in the public interest and

New Car Registrations and Estimated Dollar Volume by Retail Price Classes*

	NEW REGISTRATIONS								ESTIMATED DOLLAR VALUE							
	MARCH				THREE MONTHS				MARCH				THREE MONTHS			
	Units		Per Cent of Total		Units		Per Cent of Total		Dollar Volume		Per Cent of Total		Dollar Volume		Per Cent of Total	
	1940	1939	1940	1939	1940	1939	1940	1939	1940	1939	1940	1939	1940	1939	1940	1939
Chevrolet, Ford and Plymouth	171,771	139,434	55.00	56.24	435,853	346,679	54.68	56.29	$131,300,000	$102,000,000	48.77	48.65	$333,100,000	$253,600,000	48.31	48.52
Others under $1,000	100,210	86,470	32.09	34.88	255,750	211,563	32.09	34.35	90,600,000	79,800,000	33.66	38.05	231,600,000	195,300,000	33.58	37.36
$1,001 to $1,500	38,354	18,431	12.28	7.43	99,468	48,982	12.48	7.95	43,400,000	21,400,000	16.12	10.21	112,700,000	57,400,000	16.35	10.93
$1,501 to $2,000	1,222	2,486	.39	1.00	3,715	5,413	.47	.88	21,000,000	3,800,000	.78	1.81	6,400,000	8,400,000	.93	1.61
$2,001 to $3,000	710	1,045	.23	.42	2,266	3,060	.28	.50	1,700,000	2,400,000	.63	1.14	5,500,000	7,000,000	.80	1.34
$3,001 and Over	18	64	.01	.03	42	216		.03	100,000	300,000	.04	.14	200,000	1,000,000	.03	.19
Total	312,285	247,930	100.00	100.00	797,094	615,913	100.00	100.00	$269,200,000	$209,700,000	100.00	100.00	$689,500,000	$522,700,000	100.00	100.00
Miscellaneous	86	108			118	279										
Total	312,371	248,038			797,212	616,192										

* All calculations are based on delivered price at factory of the five-passenger, four-door sedan, in conjunction with actual new registrations of each model. The total dollar volumes are then consolidated by price classes.

New Passenger Car Registrations

	MARCH 1940	FEBRUARY 1940	MARCH 1939	THREE MONTHS 1940	THREE MONTHS 1939	Per Cent Change, 3 Months, 1940 over 1939	Per Cent of Total Three Months 1940	Per Cent of Total Three Months 1939	FIVE MONTHS MODEL YEAR 1940	FIVE MONTHS MODEL YEAR 1939	Per Cent Change
Chevrolet	79,138	55,661	59,973	200,744	144,988	+ 38.0	25.18	23.53	325,083	248,972	+ 30.6
Ford	52,950	37,742	43,900	133,516	112,214	+ 19.0	16.75	18.21	224,806	178,800	+ 26.0
Plymouth	39,683	28,923	35,561	101,593	89,477	+ 13.4	12.74	14.52	130,240	156,769	- 16.8
Buick	23,859	17,749	19,607	64,716	48,366	+ 34.0	8.12	7.85	116,164	86,197	+ 34.8
Pontiac	20,794	14,045	14,598	51,042	35,472	+ 43.9	6.40	5.76	87,291	61,212	+ 42.6
Dodge	19,466	14,556	19,269	50,536	47,257	+ 7.0	6.34	7.67	63,882	75,326	- 15.2
Oldsmobile	17,905	12,508	13,094	44,554	33,263	+ 34.0	5.59	5.40	78,131	58,666	+ 33.2
Chrysler	9,077	7,073	6,833	23,524	17,342	+ 35.5	2.95	2.81	29,402	28,139	+ 4.8
Studebaker	8,916	6,569	4,495	22,632	11,006	+105.5	2.84	1.79	39,795	20,474	+ 94.5
Mercury	7,837	5,610	5,318	20,181	13,366	+ 51.0	2.53	2.17	34,310	20,201	+ 70.0
Hudson	7,060	5,216	4,462	18,013	11,054	+ 63.0	2.26	1.79	34,355	20,461	+ 67.9
Packard	6,744	4,875	3,800	16,890	9,552	+ 77.0	2.12	1.55	31,717	18,619	+ 70.3
De Soto	6,348	5,076	5,201	16,561	12,343	+ 34.0	2.08	2.00	21,494	20,428	+ 5.2
Nash	5,295	3,582	5,421	13,212	12,629	+ 4.6	1.66	2.05	22,833	18,233	+ 25.3
Lincoln	1,846	1,543	1,751	5,397	5,068	+ 6.3	.68	.82	9,423	6,430	+ 12.0
Willys	2,074	1,479	1,033	5,231	2,758	+ 90.0	.66	.45	9,155	4,680	+ 95.5
La Salle	2,125	1,359	1,944	5,225	5,046	+ 3.8	.65	.82	10,427	9,650	+ 8.0
Cadillac	984	878	1,102	3,006	3,302	- 9.1	.38	.53	5,752	5,958	- 3.5
Bantam	96	97		271			.03		422		
Crosley	62	36		149			.02		256		
Graham	24	24	404	85	1,031	- 91.7	.01	.17	193	1,745	- 89.0
Hupmobile	2	6	58	16	155	- 89.8		.03	36	256	- 86.0
Fiat	3	1		9					18		
Miscellaneous	83	17	214	109	503	- 78.3	.01	.08	142	802	- 82.4
Total	312,371	224,625	248,038	797,212	616,192	+ 29.4	100.00	100.00	1,275,327	1,044,018	+ 22.0
Chrysler Corp.	74,574	55,628	66,864	192,214	166,419	+ 15.8	24.11	27.01	245,018	280,662	- 12.5
Ford Motor Corp.	62,633	44,895	50,969	159,094	130,648	+ 22.0	19.96	21.20	268,539	207,431	+ 29.6
General Motors Corp.	144,805	102,200	110,318	369,287	270,437	+ 36.8	46.32	43.89	622,848	470,655	+ 32.4
All Others	30,359	21,902	19,887	76,617	48,688	+ 57.4	9.61	7.90	138,922	85,270	+ 63.0

backed by the political pressure of the 90 per cent, which roughly represents labor, against the 10 per cent, which represents management, the doctrine of collective bargaining has been established in America for all time."

He defined "management" as the whole managerial organization of capital from the chairman and president down to the "last and least important straw boss who exercises authority on behalf of management." He suggested that management first learn to know itself better, to define its policies and put them in writing, and keep itself thoroughly informed of its own policies. Then, and only then, he said, could management expect its lesser executives to handle disputes in the first stages.

NADA Wants Action Deferred On Proposed Fair Trade Rules

Cautions The FTC That Approval Might Hamper Efforts "To Iron Out Differences Of Opinion"

The National Automobile Dealers Association has asked the Federal Trade Commission to defer action on the proposed fair trade practice rules for the automobile industry, warning that approval of the Commission-advocated rules would hamper rather than help industry efforts to agree upon fair practices and sound contractual arrangements.

In a joint brief filed by Donald Richberg and Charles W. Bishop, NADA counsel and general counsel respectively, the organization asked the Commission to hold the proposed fair trade practice rules in abeyance pending discussions now going on among industry members which are designed to develop "a concrete practical program for the elimination of bad practices and unhappy conditions within the industry."

The brief said that "sympathetic aid of government officials" would be helpful to the industry during this period but added:

(*Turn to page* 532, *please*)

Ourselves & Government

A Check List of Federal Action Corrected to May 27

FEDERAL TRADE COMMISSION

FAIR TRADE PRACTICE RULES—NADA granted extension of time to file brief in opposition to FTC's proposed rules. Other statements, also in opposition, have been filed.

F.O.B. PRICE CASE—Trial examiner's report next development expected in the Ford case. Testimony closed in GM case, after respondent waived oral argument. Trial examiner's report, commission brief and respondent's reply brief all filed.

VS. GENERAL MOTORS—Case involves Commission allegation that GM dealers were required to handle GM parts to the exclusion of others.

New Truck Registrations

	March 1940	February 1940	March 1939	THREE MONTHS 1940	THREE MONTHS 1939	Per Cent Change, 3 Months 1940 over 1939	Per Cent of Total Three Months 1940	Per Cent of Total Three Months 1939
Chevrolet	18,398	14,145	16,565	48,540	42,187	+ 15.0	34.66	36.09
Ford	14,993	12,092	11,886	40,367	31,298	+ 29.0	28.82	26.77
International	6,943	5,009	5,507	17,490	14,500	+ 20.5	12.49	12.40
Dodge	5,356	4,341	4,852	14,042	12,675	+ 11.0	10.02	10.84
G. M. C.	3,457	2,724	2,772	9,323	7,374	+ 26.5	6.66	6.31
Plymouth	949	767	879	2,434	1,896	+ 28.1	1.74	1.62
Diamond T	573	425	392	1,534	1,078	+ 42.5	1.10	.92
Mack	534	425	483	1,531	1,363	+ 12.6	1.09	1.17
White	660	371	349	1,474	937	+ 57.5	1.05	.80
Willys-Overland	233	182	148	588	333	+ 76.5	.42	.28
Divco	116	180	153	439	376	+ 16.8	.31	.32
Federal	161	113	122	427	286	+ 49.6	.30	.24
Autocar	137	94	150	374	427	- 12.5	.27	.37
Studebaker	154	101	190	340	502	- 32.3	.24	.43
Brockway	123	92	168	332	393	- 15.5	.24	.34
Hudson	76	60	39	192	130	+ 47.7	.14	.11
Bantam	56	48	60	142	131	+ 8.5	.10	.11
F. W. D.	35	27	10	89	48	+ 85.4	.06	.04
Sterling	24	31	17	77	71	+ 8.5	.05	.06
Reo	6	4	175	21	502	- 95.9	.01	.43
Miscellaneous	109	105	166	323	393	- 17.8	.23	.35
Total	53,093	41,336	45,083	140,079	116,900	+ 20.0	100.00	100.00

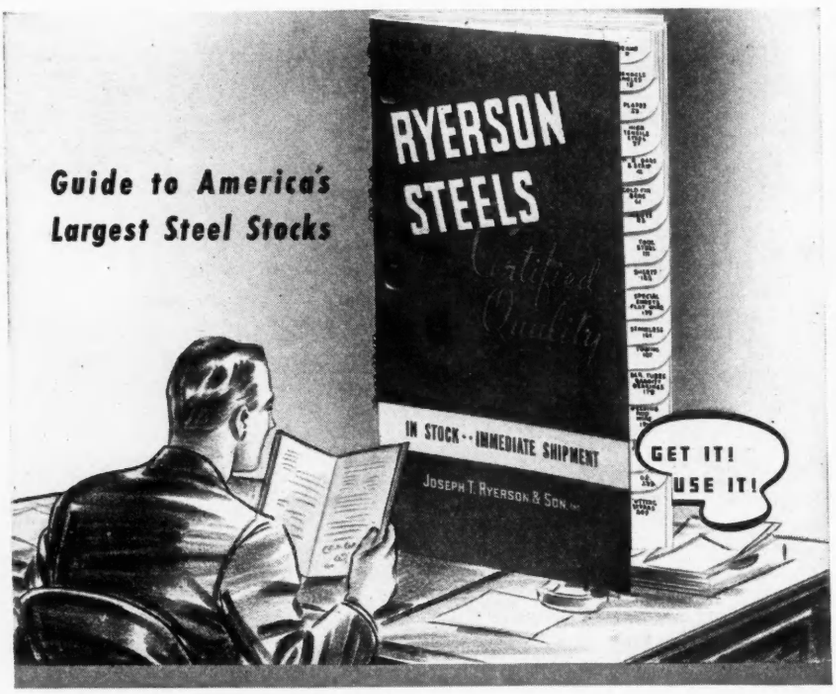
Consumer Jitters Allayed By Moves To Boost Steel Output

Relatively Little Of Armament Program Will Require Products Of Continuous Rolling and Finishing Mills

It was the undertone of the steel market rather than the prevailing state of things that was affected by announcement of the President's preparedness program and the turn of affairs on the European battlefields. It was only natural that consumers here and there should give some thought to the possibility of delays in shipments, when they would need steel, as a result of the pressure on production by our own military program and growing export demand.

Reassuring, however, were the steel industry's measures to step up raw steel output, nearly all important producers having added to their prospective list of active furnaces. It is recognized that upward progress of the operating rate still has room for considerable climbing before full capacity is employed and neck-of-the-bottle conditions have to be feared. Specifications, the true test of demand, are now thought to be running neck and neck with production.

There certainly is no cause for uneasiness on the score of finishing capacity. Relatively little of the armament program, in so far as it has been outlined, will call for the product of continuous rolling and finishing mills, which yield the body and fender material that, among all steel items, are of greatest interest to automobile manufacturers. The latter are expediting as much as possible specifications covering sheets and strip steel, bought during the April "bargain" period, and June shipments are expected to be correspondingly heavy. As to the price situation that will confront automobile manufacturers, when they enter the market for their first 1941 model tonnage requirements, developments between now and then, which under present conditions are unforeseeable, will be the determining factor. While there has been no change in the steel market's dollar-and-cents set up, its undertone indicates a strengthening of the position of producers.—W. C. H.



THE NEW RYERSON STOCK LIST

Speeds — and simplifies — steel buying

New products . . . new analyses . . . new sizes . . . more reference tables and helpful charts . . . improved mechanical features—all combine to make the new Ryerson Stock List an outstanding manual for steel users. Whatever your need in steel and allied lines, you can rely on the Ryerson Stock List as a dependable guide to Immediate Stock Shipment of uniform high quality products.

Over 10,000 kinds, shapes and sizes of Ryerson Certified Steels are available from 10 large, fully-equipped plants. Every pound of steel carried in stock by Ryerson represents the highest quality available in each particular classification.

If you have not received your copy of this new book, write for it today. If you have one, keep it handy, use it often, profit by it repeatedly. Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON CERTIFIED STEELS

RYERSON

Henry Ford Lends Support To Farm Youth Foundation

A National Farm Youth Foundation has been established in Dearborn, Mich., by the Ferguson-Sherman Mfg. Corp., with the active cooperation of Henry Ford, founder and Edsel Ford, president of the Ford Motor Co. Educational courses in farm management and engineering, as well as practical training in the operation of modern farm equipment, will be made available at once to at least 20,000 young men on American farms, between the ages of 18 and 25.

"Young men of the farm have not realized their opportunities on the home soil," said Henry Ford in announcing his participation in the Foundation, "and the young men of the city have not appreciated the career a farm offers. As a result, farming has been neglected.

"The family system of farming has suffered and we want to see it rebuilt. As a matter of fact, the Foundation seeks to help the young man of the farm to realize his aspirations for happiness and prosperity."

Jobs will go to 58 of the scholarship students and hundreds more will find places in industry and business associated with farming, according to announced plans.

The first 29 awards are contracts under which the students selected will be employed a year at the Ferguson-Sherman plant in Dearborn at a salary of $150 a month. The next 29 students

will receive one-year contracts to work with the company's distributors at $125 a month. An additional 725 will be placed on an honor roll for first selection as other openings occur in plant and offices of the company, its distributors and dealers. The primary objective is to train young men so that they may become proficient, and experienced, in solving the problems common to the business concerns and the farm operators of the local community.

April U. S. Crude Rubber Consumption 11% Over '39

According to statistics released by the Rubber Manufacturers Association, Inc., it is estimated that rubber manufacturers in the U. S. A. consumed 50,103 long tons of crude rubber during the month of April. This represents a decrease of less than one per cent under the March consumption of 50,192 long tons, but is 10.7 per cent above April, 1939, when 45,268 (revised long tons were consumed.

Gross imports for April as reported by the Department of Commerce were 70,699 long tons, representing an increase of 19.3 per cent above the March figure of 59,258 long tons, and were more than double the April, 1939, imports which amounted to 32,021 long tons.

Total domestic stocks are estimated by the Association as of the end of April to be 162,282 long tons, an increase of 14 per cent over the stocks on hand at the end of March, which were 142,414 (revised) long tons, but 13.7 per cent under the stocks of 188,-074 (revised) long tons on hand at the end of April, 1939.

Crude rubber afloat to United States ports on April 30 is estimated to have been 102,557 long tons, which compares with 113,619 long tons reported afloat as of the end of March, and 57,918 long tons afloat April 30, 1939.

Reclaimed rubber consumption for April is estimated at 16,298 long tons, production at 16,568 long tons, and stocks on hand April 30, 1940, at 27,558 long tons.

ADVERTISING

Fuller & Smith & Ross, of Cleveland, has been named advertising agency for the Ford tractor, which is distributed nationally by the Ferguson-Sherman

The Burd Piston Ring Co., Rockford, Ill., enthusiastically reports excellent results for its newest promotional aid to merchandisers of Burd piston rings. Jobbers handling this product are offered a specially prepared Rand-McNally road atlas. There are 112 pages in the 12 in. by 16 in. volume. It's free to those who send in three labels from Burd "Hi-Speed" or "Super Hi-Speed" combination sets plus a nominal mailing fee.

Allan Brown, advertising manager and public relations director of Bakelite Corp. won the New York Technical Publicity Association award for distinguished service in the cause of technical advertising.

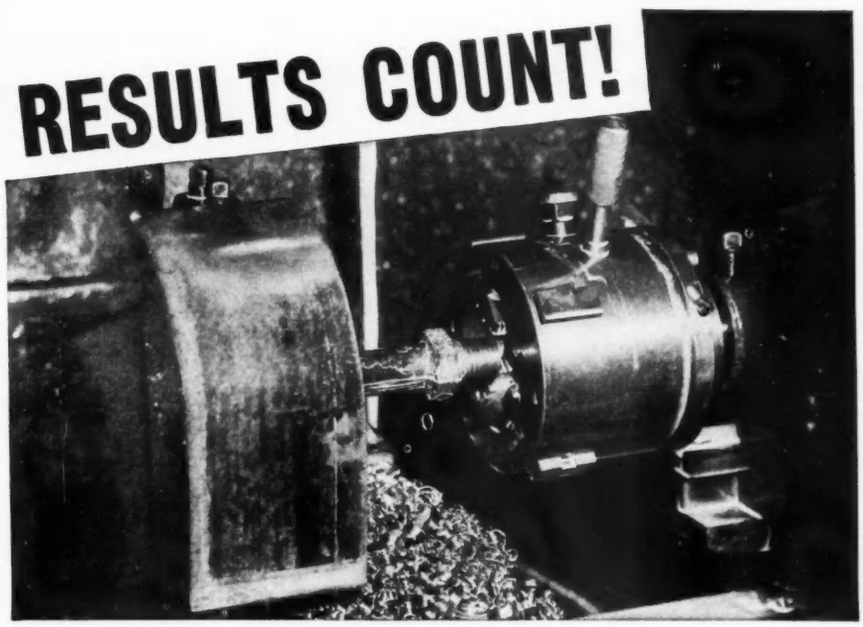
International Harvester Co. has entered the industrial refrigerating business with a line of pneumatic water agitation devices designed to keep foods at an even low temperature

USL Battery Corp. division of Auto-Lite has undertaken a four-season advertising campaign, designed to level out the fall and winter selling peaks.

Ford Reports Profit Of $16,402,746 In 1939

Earnings of $16,402,746 in 1939 by the Ford Motor Co. were contrasted with a loss for the company of $18,560,-459 in the previous year in a report filed recently with the Massachusetts Commissioner of Corporations and Taxation. These figures do not take into account any dividends which may have been paid to the Ford family, sole owners of the stock.

The report shows a profit and loss account of $601,239,506, compared with $588,821,275 at the end of 1938.



"Excellent results for over five years have proved the value of Cities Service Cutting Oils in all of our operations, including threading, tapping and drilling," writes the purchasing director of a large electrical manufacturing company.*

This is but one of many examples where Cities Service Metal Cutting Lubricants have justified the title, "Service Proved." We will welcome an opportunity to tell you more about them and about our Lubrication Engineers' Service. Just fill out the coupon below and mail it for further information.

Copies of our booklet, "Metal Cutting Lubrication" are still available to users of metal cutting lubricants. Write for your copy today before the supply is exhausted.

*Name furnished on request.

CITIES SERVICE Cutting Oils "SERVICE PROVED"

FREE! JUST CLIP AND MAIL

CITIES SERVICE OIL COMPANY,
Sixty Wall Tower, Room 1626A, New York.

Please send me information concerning your Lubrication Engineers' Service ☐

Please send me booklet on Metal Cutting Lubrication ☐

Name..... Title.....

Business Address.....

Firm Name.....

City..... State.....

NADA

(*Continued from page* 529)

"It would be most unfortunate if the Commission were committed in advance of, or during the progress of, such discussions to the adoption of specific rules which might, even though well intended to accomplish laudable purposes, hamper efforts of the members of the industry to iron out differences of opinion and to agree upon fair trade practices and sound contractual arrangements."

Mr. Richberg told the FTC that since the proposed fair trade practice rules were considered at hearings on March 20, the program being developed by the organization has been in the hands of a representative planning committee, whose activities are being directed toward greater cooperation between dealers and between dealers and manufacturers. He said the results are expected to benefit the industry and the public.

The brief noted that since a recent dealer poll, opinion had crystallized and that members of the industry wanted an opportunity to put their house in order before "seeking to impose the burden of that job or any part thereof upon the government."

Also contained in the brief was a detailed review of the rules as rewritten and proposed by the Commission. Mr. Richberg had this to say of the rules advocated by the FTC:

1. They fail to deal effectively with the relationship between manufacturers and dealers.

2. They fail to provide relief from the paramount problem in the industry —the used car problem.

3. Many of the rules are so broad and indefinite that compliance cannot be intelligently made.

4. Rule 9, designed to prohibit so-called deceptive "packing" cash delivered price or "packing" finance charges, is not a proper statement of the law on establishing prices. This rule was not considered at the first trade practice conference and was advanced by the FTC early this year.

5. Rule 11, covering the deceptive concealment in bills of sale and requiring the performance of an affirmative act—the delivery of an itemized invoice —is legislative in character and beyond the power of the Commission under the FTC act.

6. Rule 14, pertaining to misrepresentation of used motor vehicles, covers a practice only rarely occurring in interstate commerce and generally beyond the Commission's authority.

7. Rule 15, designed to prohibit the passing off of used or driven motor vehicles as new, by the conjunctive joining of the terms "used" and "driven," is at variance with industry practice.

8. Rule 16, aimed at any tampering with speedometers, is too broad and includes in its prohibition a practice which is free from any fraud or deception; for example, changing a speedometer reading after a new car is driven from factory to dealer.

9. Rule 24, which seeks to prohibit coercion, has been rewritten in general terms since the more specific rule was proposed by the industry, and has thereby been emasculated and rendered useless as a deterrent to the practice of coercion.

10. Rule 26, aimed at eliminating unlawful conspiracies and combinations to fix or control prices and create monopolies, was once voted out by the industry. Its inclusion in the present proposed rules makes voluntary compliance beyond hope.

GM Enters Airplane Propeller Business

On June 1, 1940, General Motors Corp. entered the airplane propeller business through the acquisition of the assets of Engineering Projects, Inc., Dayton, Ohio. The new division will be known as Aeroproducts Division of General Motors Corp. It will continue propeller development, which has been conducted by the acquired company.

Werner J. Blanchard, formerly president of Engineering Projects, Inc., will become general manager of the new division, and Charles S. J. MacNeil, formerly vice-president of Engineering Projects, Inc., will become chief engineer.

PRECISION

Dependable Quality

DANLY DIE SETS AND DIE MAKERS' SUPPLIES FROM THE 9 DANLY BRANCH STOCKS

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Business in Brief

***Written by the Guaranty Trust Co., New York, Exclusively for* AUTOMOTIVE INDUSTRIES**

Moderate expansion of general business activity has replaced the nearly stable level maintained for several weeks. *The Journal of Commerce* index, without adjustment for seasonal variation, for the week ended May 11 broadened its advance by just over one full point to stand at 95.5 per cent of the 1927-29 average, as against 93.9 a fortnight earlier and 78.3 a year ago. The adjusted index of The New York *Times* for the preceding week registered a fortnight's advance of seven fractional points to 93.9 per cent of the estimated normal.

Retail trade improved substantially in the first half of May, with sales in the mid-month week 6 to 12 per cent above those a year ago, according to Dun & Bradstreet estimates. Department store sales during the week and four weeks ended May 4 were four per cent above the comparable 1939 levels, according to the Federal Reserve compilation.

Production of electricity by the light and power industry during the week ended May 11 rose by less than the usual seasonal amount and was 10.0 per cent above the corresponding output last year, as against a similar margin of 9.8 per cent a fortnight earlier.

Railway freight movement in the same period reached a new 1940 peak, with the loading of 680,657 cars, 5.6 per cent more than the number two weeks earlier and 22.7 per cent greater than a year ago.

Bank debits to other than inter-bank accounts in leading cities during the week ended May 8 were 6.4 per cent above the corresponding total in 1939, the cumulative total for 13 weeks registering a similar gain of six per cent.

Crude oil production during the week ended May 11 rose to an average of 3,825,450 barrels daily, exceeding by 224,450 barrels the required output as computed by the Bureau of Mines; the similar excess in the last full week of April was 295,250 barrels.

Average daily output of bituminous coal in the week ended May 4 was 1,322,000 tons, as against 1,307,000 tons for the week before and only 475,000 tons a year ago, when a strike was in effect.

Engineering construction contracts awarded during the week ended May 16 were 17 per cent below the corresponding 1939 total, according to *Engineering News-Record*. Contracts for private work, however, were 26 per cent above the comparable amount last year, recording the seventh consecutive gain shown by the year-to-year comparison, in contrast with a drop of 34 per cent in awards for public projects.

Cotton-mill activity advanced less than seasonally in the week ended May 4, The New York *Times* adjusted index declining to 133.9, as compared with 122.3 a year ago.

New life insurance written during April was 13.5 per cent greater than the comparable amount last year, but for four months the total this year was 1.6 per cent less than in 1939.

Professor Fisher's index of wholesale commodity prices for the week ended May 10 declined to 84.0 per cent of the 1926 average from 84.3 for the week before.

Excess reserves of the member banks of the Federal Reserve system rose $170,000,000 during the week ended May 15 to an estimated new peak of $6,300,000,000. Business loans of the reporting members a week earlier exceeded by $552,000,000, or 14 per cent, the comparable amount last year.

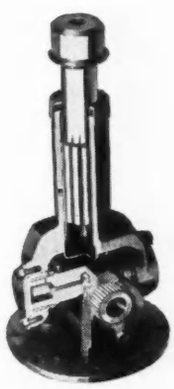
Oldsmobile Expands Lansing Facilities

Oldsmobile Division of General Motors Corp. has expanded its manufacturing facilities in Lansing, Mich., by purchase of the property of the old Ryan-Bohn Foundry Co. The deal gives Oldsmobile buildings and 50 acres of property adjoining the Fisher body plant and brings the Division's Lansing acreage to 183.

Remodeling of present structures and new buildings will accommodate a heavy stamping plant.

THE Accepted Spicer UNIVERSAL JOINT

The superiority of Spicer Needle Bearing Universal Joints is accepted among all branches of the automotive industry. This acceptance has resulted from their years of faultless performance as original and replacement equipment on many leading makes of cars, trucks, buses and tractors. The tested and proved advantages of the Spicer Needle Bearing principle in reducing friction, increasing load capacity, providing quiet efficient performance has made it the most desirable universal joint for all automotive equipment. To improve performance and service, insist upon Spicer Needle Bearing Universal Joints.



SPICER Needle-Bearing Universal Joint

SPICER Needle-Bearing Assembly

Spicer Manufacturing Corporation • Toledo, Ohio

BROWN-LIPE CLUTCHES and TRANSMISSIONS | SALISBURY FRONT and REAR AXLES | SPICER UNIVERSAL JOINTS | PARISH FRAMES READING, PA.

Chrysler Continues Efforts To Restrain Compensation Payments

Corporation's Suit to Halt Outlay of $1,892,000 In Benefits May Challenge Constitutionality of Mich. Unemployment Act

Constitutionality of the Michigan Unemployment Compensation Act may be challenged in connection with the suit which the Chrysler Corp. has brought in Ingham County Circuit Court at Lansing to restrain the state from payment of $1,892,000 in unemployment benefits to more than 23,000 Chrysler workers. At the hearing, Judge Leland W. Carr hinted that the law did not provide the proper judicial review of findings by the compensation commission.

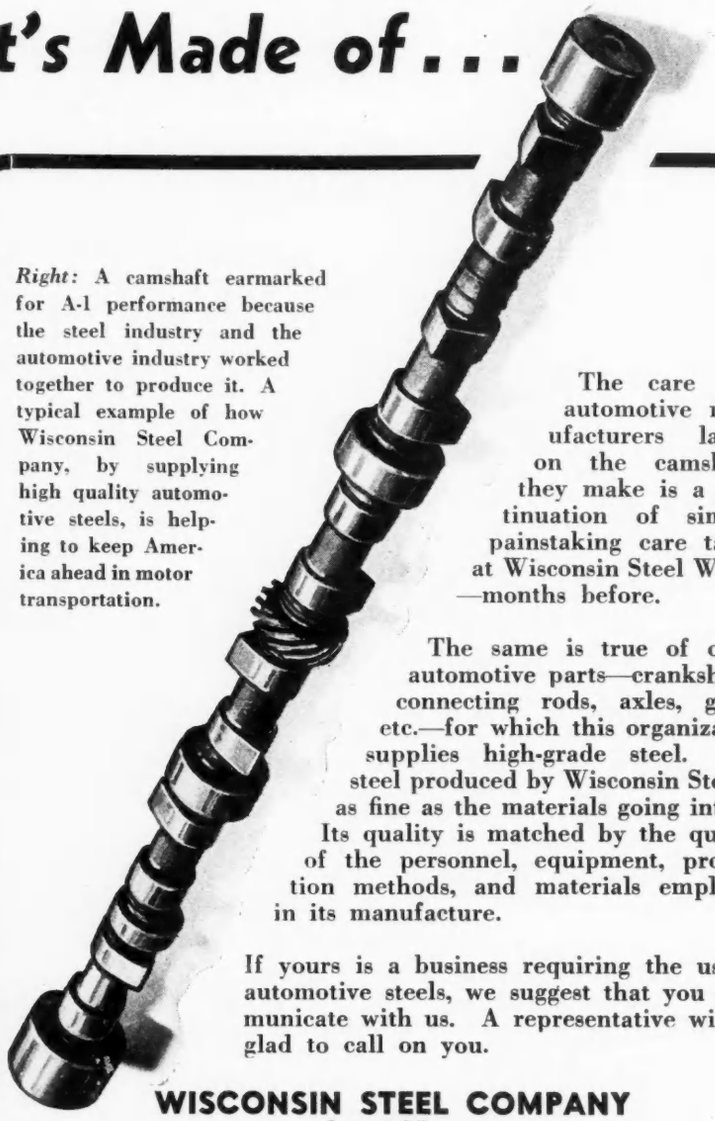
Judge Carr had refused to vacate a temporary injunction forbidding the payment of benefits even though the act provides for immediate payment after a double affirmation of claims. Such an affirmation has been made by Referee Charles Rubinoff and by the Appeal Board of the Michigan Unemployment Compensation Commission. The law makes no provision for recovery of benefits erroneously paid.

Counsel for the corporation, the commission and the UAW-CIO were given until May 28 for the filing of additional briefs. Meanwhile, the commission is redetermining the status of employes in six Chrysler plants who were not immediate parties to last fall's 54-day strike. This may increase benefit payments to as much as $3,000,000 and as many as 35,000 workers, provided the courts uphold the act.

Michigan employers have contributed $148,362,037 in taxes to the unemployment compensation fund. Benefit payments have totaled $84,510,681 since disbursement began July 1, 1938. The balance in the fund May 1 was $63,851,-356.

Negotiations between General Motors Corp. and the UAW-CIO are reported progressing satisfactorily in their fourth week. An agreement that will make possible the speedy and satisfactory handling of grievances and that will provide for a general wage increase is expected by UAW-CIO spokesman. The union is negotiating for 53 General Motors plants, the latest to be included being the Hyatt Roller Bearing Division

—As Fine as the STEEL It's Made of . . .



Right: A camshaft earmarked for A-1 performance because the steel industry and the automotive industry worked together to produce it. A typical example of how Wisconsin Steel Company, by supplying high quality automotive steels, is helping to keep America ahead in motor transportation.

The care that automotive manufacturers lavish on the camshafts they make is a continuation of similar painstaking care taken at Wisconsin Steel Works —months before.

The same is true of other automotive parts—crankshafts, connecting rods, axles, gears, etc.—for which this organization supplies high-grade steel. The steel produced by Wisconsin Steel is as fine as the materials going into it. Its quality is matched by the quality of the personnel, equipment, production methods, and materials employed in its manufacture.

If yours is a business requiring the use of automotive steels, we suggest that you communicate with us. A representative will be glad to call on you.

WISCONSIN STEEL COMPANY

General Offices:
180 North Michigan Avenue Chicago, Illinois

Affiliate of International Harvester Company

WISCONSIN STEEL

CALENDAR

Conventions and Meetings

Automobile Manufacturers Association, Annual Meeting, Detroit.....June 12
SAE Summer Meeting, White Sulphur Springs, W. Va. .....June 9-14
Automotive Engine Rebuilders Association, Convention, St. Louis, Mo., June 10-13
American Society for Testing Materials, Annual Convention, Atlantic City, N. J. .....June 24-28
National Industrial Advertisers Association, Annual Meeting, Detroit, Sept. 18-20
American Society for Metals, Annual Meeting, Cleveland, Ohio....Oct. 21-25
American Welding Society, Annual Meeting, Cleveland .....Oct. 20-25
Aeronautical Chamber of Commerce of America, Inc., Annual Meeting, New York .....Dec. 5
National Association of Manufacturers, Annual Meeting, New York...Dec. 9-13
National Automobile Dealers Association, Convention, Pittsburgh, Pa. Jan. 20-23, 1941

Shows at Home and Abroad

National Automobile Show, Grand Central Palace, New York .....Oct. 12-19
Detroit Automobile Show .....Oct. 12-19
Pittsburgh Automobile Show.....Oct. 19-26
National Metal Congress & Exposition, Cleveland, O. .....Oct. 21-25
Chicago Automobile Show....Oct. 26-Nov. 3
Automotive Service Industries Show, Chicago .....Dec. 9-14

CENSORED

An exclusive feature prepared by the London correspondent of AUTOMOTIVE INDUSTRIES, *M. W. Bourdon.*

Motor Transport (London) suggests in an editorial that, with increasing shortage of materials for the production of new trucks and buses and for the maintenance of existing fleets, the Government should authorize the import of a limited number of American vehicles. Questions of currency and shipping space, it is urged, might well be outweighed by civilian transport needs.

* * *

Seventy-six filling stations for the supply of low-pressure coal gas to motor vehicles equipped with gas bags are in operation in London. About 30 are garages with special meters installed, the remainder being operated by gas-producing companies.

* * *

At the annual meeting of the Albion Motor Co. (truck and bus manufacturers) the chairman voiced a complaint of the widespread "poaching" of skilled men by offers of higher wages, and said that since the outbreak of war the company had lost on this account over 25 per cent of its tool-room staff and a great many inspectors and skilled machinists.

* * *

The English motor trade war executive recently appealed to manufacturers of all types of motor vehicles for an increase in the margin of profit allowance to dealers. Retail prices could be increased accordingly, it was urged, for the public would realize that, as in the case of other commodities, an increase would be justified by the higher costs of distribution due to the war.

at Harrison, N. J., which voted 967-318 for the UAW-CIO in an election May 10. Elections also have been ordered by the NLRB for the Chevrolet Commercial Body Division at Indianapolis, the Allison Engineering Division at Speedway City, Ind., and the Delco Products division at Dayton, Ohio.

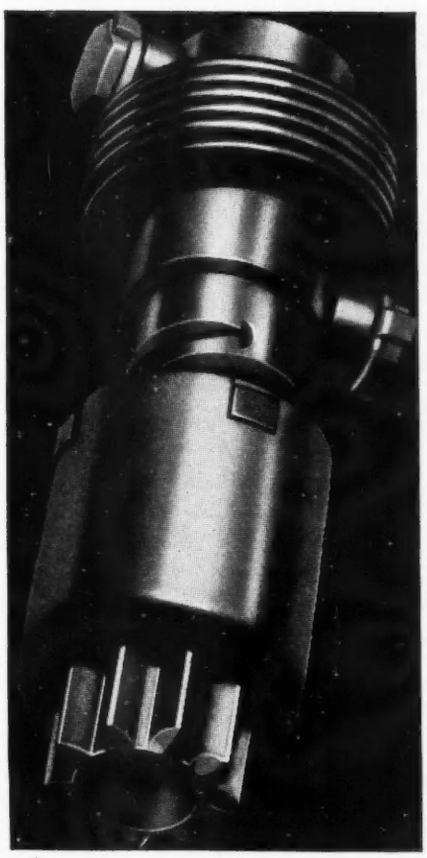
The Mechanics Educational Society of America, an unaffiliated union, was certified May 21 as sole bargaining agent for the production and maintenance employes of the Diesel Engine division of GM in Detroit. In the election of April 17, the MESA had received 204 votes, the UAW-CIO 78 and no union, 107.

A strike was averted in three General Motors plants in Canada when locals at Oshawa, St. Catherines and Windsor, Ont., voted to accept a settlement. Its terms include clauses governing seniority rights, improvements in grievance procedure and time and a half pay on all legal holidays except Good Friday.

Three banking officers of the UAW-CIO were arrested at the main gate of the Ford Motor Co., in Dearborn, Mich., May 22, when they attempted to distribute handbills to Ford workers changing shifts. The three held for violating Dearborn's ordinance which forbids distribution of handbills on traffic congested streets were Roy J. Thomas, president; George F. Addes, secretary-treasurer, and Richard T. Leonard, regional director of the UAW-CIO. The three union officers submitted to the arrests in order to test the constitutionality of the Dearborn ordinance which the union maintains is contrary to a decision of the U. S. Supreme Court.

After his arrest, Thomas predicted that the Ford Motor Co. would be under a CIO contract before many months. The three officials were finger printed and then released to their attorney. They were to be arraigned at a later day. The UAW-CIO recently asked the Dearborn city council to repeal its handbill ordinance without success.

There are *billions* of starts behind a BENDIX DRIVE



A MIGHTY impressive record stacks up behind the Bendix Drive. One of the world's most widely used automotive units, it has been faithfully starting millions of cars automatically many times a day for many years.

The Bendix Drive is simple, reliable and virtually trouble-proof. At the touch of a starter button, it takes hold—starts the engine—lets go—and then protects the starter from damage by unintended operation.

Car owners take such dependability somewhat for granted. But there's a lot behind that unfailing service . . . a lot of experience in knowing how to build right and sticking to the strictest specifications in materials and workmanship.

Bendix Drive is built in sizes and types to start every kind of automobile, marine or Diesel engine.

ECLIPSE MACHINE DIVISION
BENDIX AVIATION CORPORATION
ELMIRA, NEW YORK

MEN . . . . . .

Harry G. Moock, vice-president of the Plymouth division of Chrysler Corp., will be the principal speaker at the luncheon meeting of the Newspaper Advertising Executives Association convention in Chicago, June 25.

Lawrence V. Nagle has been elected vice-president of the Udylite Corp., Detroit. Other officials of the company, recently reelected, are **Charles Awkerman**, board chairman; **L. K. Lindahl**, president; **C. H. Reeme**, vice-president and treasurer; **Horace S. Maynard**, secretary; **A. L. Barak**, assistant treasurer; **John C. Moons**, assistant secretary.

Paul Klotsch has been appointed chief engineer of the Automobile Division of the Crosley Corp. Mr. Klotsch formerly was a member of the experimental engineering department of the Briggs Mfg. Co.

Charles B. Bohn, former president, has been elected to the newly created post of chairman of the board by directors of the Bohn Aluminum & Brass Corp. **Peter A. Markey**, vice-president and treasurer, has been elevated to the presidency. **Simon D. den Uyl**, the secretary, becomes treasurer. Two new vice-presidents have been named: **Emerson Frantz** in charge of sales, and **Henry Levitt** in charge of the Michigan Smelting & Refining division. **F. M. Taylor** has been named assistant secretary and assistant treasurer.

Roscoe L. Hambleton has been named manager of the foreign division of the Crosley Corp. Mr. Hambleton formerly was associated with General Motors Corp. in the Overseas Division.

Sam C. Mitchell has been appointed manager of the Automobile Division of The Crosley Corp. Mr. Mitchell formerly was associated with the Nash-Kelvinator Corp., Detroit.

John H. Abbott has been named sales manager of the Rotary Electric Steel Co., Detroit, succeeding J. S. Andrews. Mr. Abbott was associated with the steel and tube division of the Timkin Roller Bearing Co. before joining Rotary Electric in 1938.

Cutler-Hammer, Inc., Milwaukee, Wis., has announced the appointment of **O. P. Robinson** to its Pittsburgh sales engineering staff.

George M. McGranahan, now assistant chief engineer at The Dow Chemical Co.'s Midland plant, is being transferred to Freeport, Tex., to become director of production engineering. This new Dow plant, costing $5,000,000 and located on 800 acres of land, with three miles of harbor frontage, will produce from sea water, magnesium for the manufacture of Dowmetal.

Pierre S. du Pont has retired as chairman of the board, and **Lammot du Pont** has resigned as president of E. I. du Pont de Nemours & Co. Lammot du Pont is now chairman of the board, and **Walter S. Carpenter, Jr.**, a vice-president, has been made president of the company. **Irénée du Pont**, a former president of the company, has resigned as vice-chairman of the board of directors. No appointment has been made to this position. He and Pierre S. du Pont will continue as members of the board and of the finance committee, on which Lammot du Pont also will serve. Mr. Carpenter, in accepting the presidency of the company, resigned as chairman of the finance committee. **Angus B. Echols**, a vice-president, has been made chairman of the committee. **J. B. Eliason**, treasurer of the company, has been made a vice-president and a member of the board of directors. Mr. Eliason will continue to serve as treasurer.

IT wasn't there again today—and if it doesn't get there pretty soon the production superintendent is going to have a fit—and the boss is going to "blow up!" when orders are cancelled because the plant can't deliver the goods. That needn't happen.

One thing you can count on when you come to Accurate is service. Just as much care and attention is given to Accurate service as to the quality and accuracy of Accurate Springs. It means that immediate and painstaking attention is given to every detail of your order—you get exactly what you want, when you want it!

Come to Accurate for your springs, wire forms, and stampings. You'll be glad you did.

Accurate Springs

Spring Handbook!
A handy source of otherwise hard-to-find data. Send for your free copy today.

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3811 West Lake Street • Chicago, Illinois

BOOKS . . . .

MOTOR TRUCK FACTS. *1940 Edition. Published by the Automobile Manufacturers Association, New Center Building, Detroit, Mich.*

Among striking developments in the industry recorded by this statistical

handbook for commercial cars and motor trucks in the United States is the fact that registration of trucks in 1939 totaled 4,320,829 units, a new all-time high for the nation. American farmers continue as the largest single group of users of commercial vehicles, operating one out of every four trucks registered. Eighty-six per cent of the trucks in the United States are privately owned. *Motor Truck Facts* points out that special truck taxes in 1939 also set a new high record. Listed according to states, they total $430,000,000 for the year, exclusive of general taxes, such as income, property and retail sales levies.

March Financing 30% Over February

During March the dollar volume of automobile financing is reported by the Bureau of the Census, Department of Commerce, to have amounted to $143,482,765, an increase of 30.0 per cent as compared with February 1940; an increase of 18.7 per cent as compared with March 1939; and an increase of 48.9 per cent as compared with March 1938. The volume of wholesale financing, according to the Bureau, amounted to $212,330,544 in March, an increase of 13.3 per cent compared with February 1940; an increase of 34.0 per cent as compared with March 1939; and an increase of 132.7 per cent as compared with March 1938.

Road Race

(*Continued from page* 11)

at the last moment the French Government withdrew all permissions for French drivers and mechanics to leave the country and with scratch drivers and mechanics picked up haphazard the cars could not be prepared properly. The German government gave every facility to the national team, a big staff being on the course a month before the race. Field Marshal Goering is the principal stock holder in the B.M.W. company.

Ferrari, who formerly ran the Alfa Romeo racing organization, came to the line with a couple of straight eights of 64 by 60 mm. bore and stroke. These proved very fast, but the standard Fiat axle which was used proved inadequate for racing conditions and both cars fell out near the end.

The popular Fiat "500" of 34 cu. in. piston displacement came to the line with a special S.I.A.T.A. head having pushrod operated valves and a compression ratio of 9 to 1. These motors gave 32 h.p. at 5500 revolutions. Many of these cars were capable of 75 m.p.h. and the winning machine averaged 71 m.p.h. for a distance of more than 800 miles.

Gasoline consumption was 14 miles to the American gallon for the winning B.M.W., and slightly higher for Alfa Romeo and Delage.

40 YEARS AGO

A motor carriage at high speed makes an ideal pacemaker, and bicyclists have not been slow to find this out. Washington papers report that the persistent dogging of automobiles in that city by unmannerly bicycle riders has become a pronounced nuisance.

The Washington Post reports the intention of a recent steam carriage purchaser to fit his vehicle with a multiple blow-off pointing backward, which would at least keep the parasites at a somewhat respectful distance. Users of electric or gasoline carriers, however, would have to find some other defense, and the Post suggests a shotgun loaded with coarse salt.

From *The Horseless Age*, June, 1900.

Edward A. Wetzel

Edward A. Wetzel, assistant chief engineer of the Briggs Mfg. Co., died suddenly May 16 at his home in Detroit. He was assistant chief engineer of the Stutz Motor Car Co., Indianapolis, before joining the Briggs organization 11 years ago. Mr. Wetzel was 43 years old.

PERLITON SAVES!

It's thrifty, this patented liquid carburizer . . . in these many ways:

PERLITON *saves* on cost per ton of steel treated.

PERLITON *saves* by allowing lower investment in capital equipment.

PERLITON *saves* by providing a balanced bath which assures dependable, rapid production.

PERLITON *saves* by cutting production time, through faster penetration.

PERLITON *saves* through longer pot life.

PERLITON *saves* by providing better working conditions for heat treaters. No objectionable fuming.

We will welcome the chance to prove these facts to your satisfaction . . . under *your* plant conditions. Send for the Houghton Man today, or write for the Perliton book.

E. F. HOUGHTON & CO.
Chicago — PHILADELPHIA — Detroit

HOUGHTON PROGRESS THRU SERVICE
1865 1940 75 *The HOUGHTON LINE*
years of metal-working leadership

PUBLICATIONS

The **1940 Goodrich Red Book,** a catalog of Goodrich products for the tire, battery and accessory dealer, has been prepared by the B. F. Goodrich Co., Akron, Ohio.*

The Chicago Lock Co., Chicago, has issued a catalog covering its complete line of **locks.***

Advantages of **forgings** are discussed in a folder bearing the title "Choose One and Get All Seven" which has been prepared by the Drop Forging Association, Cleveland.*

The Moto Scoot Mfg. Co., Chicago, has prepared a folder in which its 1940 **motor scooter** models are described.*

Complete descriptive details and numerous illustrations of applications of Rex-Weld and Rex-Tube **flexible metal hose,** manufactured by the Chicago Metal Hose Corp., Maywood, Ill., will be found in this company's new catalog G-21.*

"Flame Cleaning and Dehydrating Iron and Steel," an eight-page illustrat d booklet ADG-1073, has been published by Air Reduction, New York.*

The Tuthill Spring Co., Chicago, has prepared a sixtieth anniversary booklet which contains an account of the company's history and descriptions of various Tuthill products.*

"Secrets of Bower Roller Bearing Design and Quality" is the title of a folder issued recently by the Bower Roller Bearing Co., Detroit.*

The comprehensive line of **conveyor equipment** built by the Saginaw Stamping & Tool Co., Saginaw, Mich., is the subject of the company's new catalog 140.*

"Gear Finishing" is the subject of a new folder brought out by the National Broach & Machine Co., Detroit."

Two new folders have been issued by the **Flexrock Co.,** Philadelphia, Pa. One describes "Colorflex", a floor dye made of colored resin, bakelite, penetrating oil and solvent. It is intended for the preservation of wood floors and the protection of concrete. The other folder describes "Flexrock" for resurfacing old wood floors.*

George Scherr Co. has brought out a catalog devoted to hand tachometers, speed indicators, cutmeters and various other types of **speed measuring equipment and instruments.***

National Highway Users Conference has published the 1940 Laws Bulletin, a digest of new **legislation affecting highway users.***

* Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.

Small Device . . .
BIG
RESPONSIBILITY
Great Performance
● "Cooling system thermostatically controlled" says the sales literature. Sounds good to the customer whether he understands it or not. If he does, he will expect to receive the improved performance and all the economies of oil and gasoline that go with accurate motor temperature control.
Now, in comparing his own with other cars he may drive in competitive demonstrations, will he ever think of the thermostat again? Probably not!
Yet month after month the same thermostat must respond uniformly to the motor's demands under all conditions of road, load, weather or pump pressure—taking care of the car's reputation for pep, performance and fuel economy.
For a responsible job like this, you had better standardize on Dole Thermostats with the non-fatiguing Dole Thermostatic Bi-Metal element.
THE DOLE VALVE COMPANY
1901-1941 Carroll Ave. • Chicago, Ill.
Detroit Office: General Motors Bldg.
DOLE
THERMOSTATS and
THERMOSTATIC BI-METAL

Formation of New Company Announced

Announcement has been made of the formation of Sheet-Wire Corp. to enter into manufacture with steel mills and non-ferrous fabricators of rods, bars and wire by what is described as an "entirely new and lower cost process" by Dean D. Francis, president. Mr. Francis was formerly vice-president, National Bronze and Aluminum Co. and president of Wheeler-Schebler Carburetor Co. The products, said Mr. Francis, are produced by continuous slitting of sheets into many strands instead of using multiple drawing dies.

Other officials of the new company include F. E. Birch, former chief engineer of Buffalo Pressed Steel Co.; F. L. Armstrong, formerly vice-president, Thorne Motor Corp. and Gas-Electric Corp.—both vice-presidents. Athel F. Denham, president, Denham & Co., industrial marketing organization, has been named secretary and assistant treasurer. In addition to his office as president, Mr. Francis is treasurer.

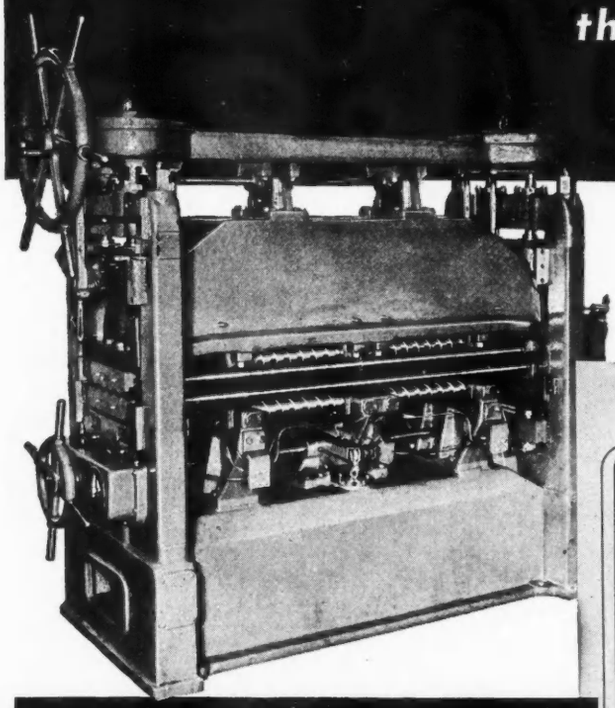
IHC Expanding Its Fort Wayne Plant

International Harvester Co. has started construction on a 147 ft. by 686 ft. repairs department storage warehouse at its Fort Wayne plant. Cost is estimated between $200,000 and $250,000, with occupation scheduled for Sept. 1, 1940.

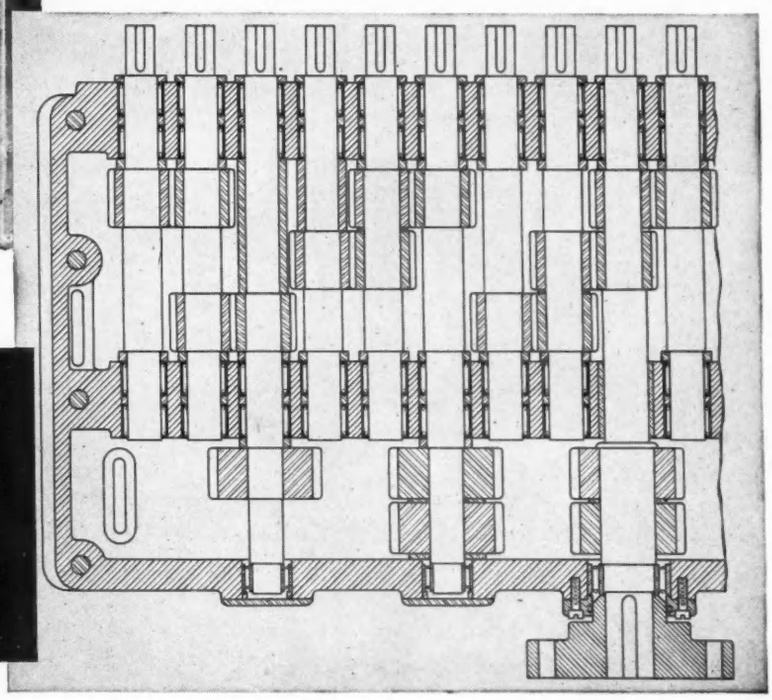
The building will be used for the storing of truck parts to allow more production space in the present main buildings. Charles M. Harrison is superintendent of the Fort Wayne Works.

REDUCED POWER INPUT 50%

through use of TORRINGTON NEEDLE BEARINGS"



SAYS PATCH-WEGNER CORPORATION, BUILDER OF THE J. I. BERNITZ, INC. PATENTED AMERICAN ROLLER LEVELER



(Above) Maximum anti-friction characteristics in this intricate Leveler assure long, trouble-free performance.

(Right) Cross-section illustrates the compact design made possible with Torrington Needle Bearings. 100 Needle Bearings permit smaller rollers, closer spacing.

EFFICIENCY in a metal straightener is gauged largely by the smallness in diameter of its rollers, and how closely they are spaced. With conventional anti-friction bearings, the factor of bulk naturally limits the size and spacing of the rollers. Take the case of the "Patented American Roller Levelers" for example: a metal straightening machine manufactured for J. I. Bernitz, Inc., New York by the Patch-Wegner Corporation . . .

This problem was solved by the use of the small, compact Torrington Needle Bearing. Result: Diameter of rollers was reduced; spacing between them closed up; speeds were increased and straightening efficiency stepped up; and a *decrease in power consumption was gained*—permitting the use of a 25 h.p. motor in place of the 50 h.p. motor formerly used.

Thus, a modification in design made possible the manufacturer's present claim of "unsurpassed straightening efficiency". And as proof of the wisdom of such a change, we quote the maker's statement that: "Supplied more than four years ago, the first Leveler is still in uninterrupted service with the original Torrington Needle Bearings."

The Torrington Engineering Department will be glad to work with *you* in adapting the advantages of the Needle Bearing to *your* products. For further information, write for Catalog No. 7. For Needle Bearings in heavier service, request Booklet 103X from our associate, Bantam Bearings Corp., South Bend, Ind.

The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.

Makers of Needle and Ball Bearings

New York Boston Philadelphia Detroit
Cleveland Chicago London, England

TORRINGTON
NEEDLE BEARING

MEN and MACHINES

(*Continued from page* 519)

column. Both rapid hand feed and worm drive feed (dial graduated in 0.001 in.) are provided. The heavy quill is hardened and ground; spindle is hardened and ground, and mounted in large ball bearings. Reversible motor is controlled by a convenient switch at top of column.

The horizontal milling machine is designed for easy handling and adapted to all classes of tool room work. The ball bearing spindle is hardened and ground chrome nickel steel, and the table is fitted to long bearing with adjustable gib in saddle. A large hand wheel with micrometer scale gives rapid vertical feed. Movements of slides are by precision Acme thread lead screws, equipped with micrometer scales. The vertical milling machine is adapted to convenient, accurate handling of a complete range of work. Spindle is chrome nickel steel and is mounted in large ball bearings. The table is fitted to long bearings, with adjustable gib in the saddle. Precision horizontal, vertical and cross feeds have hand wheels fitted with micrometer scales. A single screw vise with swivel base is furnished. This machine also can be arranged for screw cutting with quick change gear box which also provides power feed for the saddle. Capacity, length of thread 18 in.

THE Brown & Sharpe No. 12 plain milling machines (electrically controlled) have been increased in capacity. The height of the column has been increased 4 in., thereby providing a corresponding increase in the vertical adjustment of the spindle—the total adjustment now being 10½ in. The width of the base has been increased 2½ in., with a corresponding increase in the horizontal dimension of the working space—the new dimension being 17 13/16 in. from the face of the spindle head to the arbor yoke support.

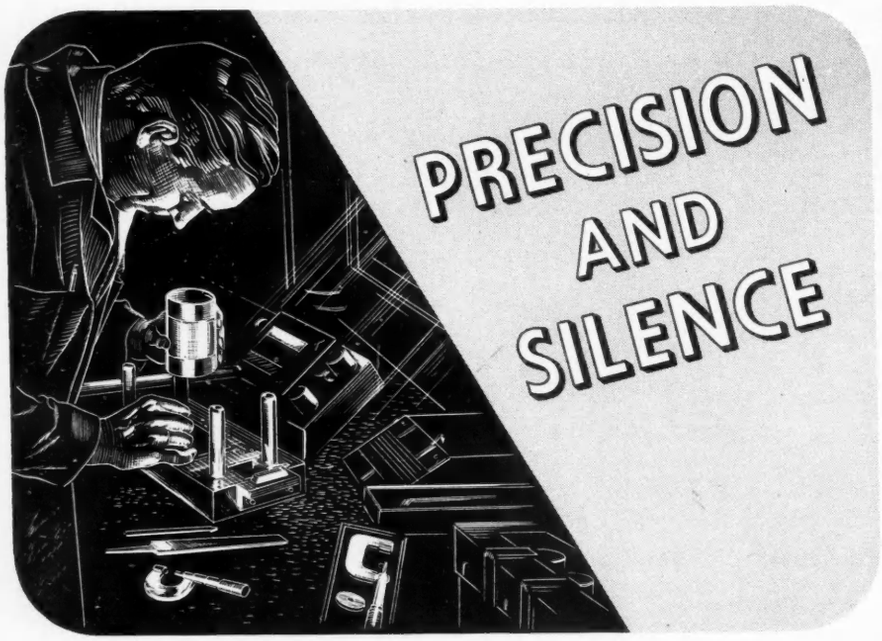
Fixtures and work pieces proportionately larger can be handled on the improved No. 12 machine with no sacrifice of efficiency or increase of power consumption. All features of design and construction have been retained, although many minor improvements and refinements have been made.

A NEW style, fluid power, variable speed twin horizontal broaching machine is now being manufactured as standard equipment by The Oilgear Co., Milwaukee, Wis.

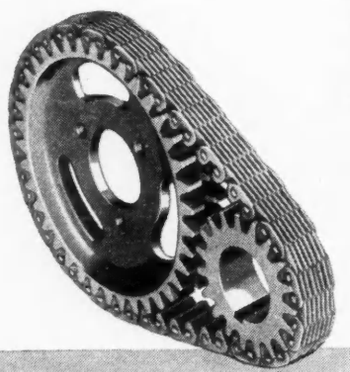
Outstanding design features of this new machine are, as follows: simple, pushbutton and alternative toe-lever switch control on each side of machine; emergency stop pushbutton on each side of machine; Oilgear's Type "DX-1211" two-way variable displacement heavy duty radial piston fluid power pump with simplified piping and oil circuit (no external control or relief valves are required); independent variable broaching speed control of each crosshead; steel crossheads with long wearing replaceable bronze liners guided on rectangular hardened and ground steel ways; gravity and capillary feed lubrication of ways and liners; vertical adjustments for pullers; dual bored and honed steel cylinders flanged to the alloy iron trough; mechanism for adjusting crosshead stroke; vertical motor driven coolant pump and automatic directional coolant valve; all-steel welded frame which supports the trough, cylinders, pump, motor and coolant pump.

General specifications of the machine are listed by the manufacturer as follows: normal pulling capacity, 12,000 lb.; peak pulling capacity, 18,000 lb.; cutting and return speed, 4 to 30 ft. per min.; broaching stroke, 36 in.; hole in face plate, 4.000-4.002 in.; distance between crossheads, 10 in.; distance between ways, 6 in.; motor recommended (1200 r.p.m.), 10 hp.

The machine is especially suitable for high-speed internal and external broaching operations on small and



PRECISION and quietness of operation go hand in hand in any mechanism. The precision of Morse Silent Timing Chains begins with the making of the dies, and continues through every manufacturing operation. Lasting quietness of operation is an important feature of Morse Silent Chain Drives. Leading automotive manufacturers recognize that quality — and specify Morse to be sure they get it.



Morse Chain Company
Ithaca, N. Y. Detroit, Mich.
Division, Borg-Warner Corporation

MORSE
SILENT TIMING CHAINS

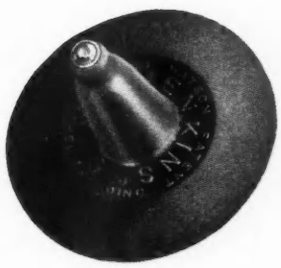
MAINTAINED AIR PRESSURE means increased tire mileage.

FLEXIBLE STEM means greater safety.

CAPLESS means no caps to remove and replace.

LEAKPROOF means no defective inserts, therefore no removable parts.

LARGER VALVE AREA means faster, easier inflation and deflation.



FROM *any* ANGLE it's JENKINS

JENKINS BROS., BRIDGEPORT CONN.

JENKINS FLEXIBLE CAPLESS TIRE VALVE

PROGRESSING WITH THE AUTOMOTIVE INDUSTRY

medium sized parts. The two rams work alternately, one on the return while the other is pulling, so that the production is limited only by the operator's ability to serve it. Ample space is provided on the face place for mounting duplicate complex fixtures.

Broaching of the hole and keyway in spiral, L.H., 20-tooth, cast-iron crankshaft gears in sequence on an Oilgear Type "XB-12" twin horizontal broaching machine is shown in the accompanying photograph. Approximately 0.032-in. stock is removed from the 1.10-in. diameter hole with the R.H. tool. A keyway 0.20-in. wide by 0.09-in. deep is broached accurately 38 deg. from the centerline of one of the gear teeth with the L.H. tool. Machine produces 240 operations or 120 finished gears per hour. The automatic puller on R.H. crosshead simplifies tool handling and reduces loading time.

OTHER new developments in machine tools and allied equipment, are as follows:

The Boyer Campbell Co., Detroit.—Face shield with a plastacele window that slides in and out of a fiber frame, simplifying replacement.

Wilson Welder & Metals Co., Inc., New York.—Automatic start and stop device for use on any magnetic starter, motor generator arc welder, such as the Wilson "Hornet," which is driven by an a.c. motor.

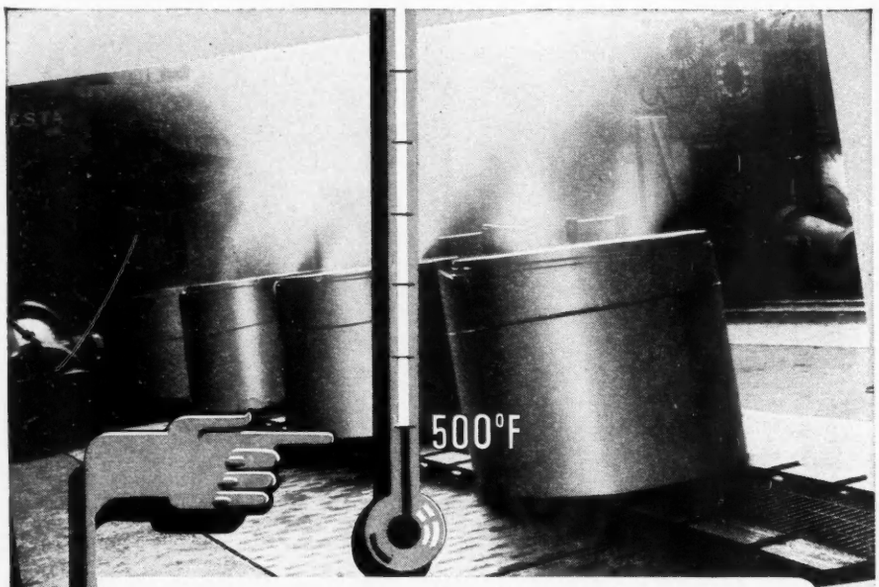
Photoswitch, Inc., Cambridge, Mass.—Pilot control, an electronic switch rendering possible control of large currents by delicate mechanisms, liquids, or extremely light contact pressure normally not capable of being used to control electrical currents. Control effected by delicate touching of two fine wires or contacts, or by their being short-circuited by a liquid or even any moist material. Pilot control can be used to monitor automatic punch presses and machine tools.

Sellstrom Mfg. Co., Chicago.—Welder's helmet made of new material that insulates against heat and weighs only 15 oz. complete with lens and holder. Feature is new lens holder. In this the inner and outer frames have concealed spring hinges which allow the outer holder to be raised or lowered in accurate positions.

Steelweld Machinery Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.—New series of bending presses adaptable for extensions of bed and ram at one or both ends. Machines in this line will handle plate in lengths up to 20 ft. and thicknesses up to ¾ in. —H. E. B., Jr.

April Operating Rate at 93.4% Of Capacity

April operating activity of the machine tool industry, according to the regular monthly statement issued by the National Machine Tool Builders' Association, remained at 93.4 per cent of capacity, the same rate reported for March, 1940.



"dag" takes over the load from here!

QUALITY YOUNGSTOWN SERVICE

Taking over the lubrication load at temperatures above 450°F. is a regular assignment for "dag" colloidal graphite. The Youngstown Sheet and Tube Company recently installed one of the largest strip mills in the country. In its operation, an extensive conveyor system forms an important unit. This system must give continuous and trouble-free service while carrying tons of coiled strip steel reaching temperatures up to 1700°F. And with bearing temperatures at 450°F. and higher, conditions are beyond the range of plain lubricants. From the first day of operation, "Oildag" Concentrated, Type 1104, diluted with kerosine has successfully supplied the lubrication needed. Specific benefits resulting have been the free operation of the rolls at all times, little or no carbon formation, and ease of lubricant application. Your oil supplier can furnish high temperature lubricants containing "dag" colloidal graphite. Ask him about them and write us for Bulletin 130 giving information on how this product works.

ACHESON COLLOIDS CORPORATION
PORT HURON, MICHIGAN

dag COLLOIDAL PRODUCTS

Publications Available

Bulletin No. 63-C covers the complete line of Series 50 **single crank presses** built by the Niagara Machine & Tool Works, Buffalo, N. Y.*

Latest developments in the P&H-Hansen WA-200 **square frame arc welder** are described and illustrated in bulletin W-26 published by the Harnischfeger Corp., Milwaukee, Wis.*

A leaflet issued by the Exact Weight Scale Co., Columbus, Ohio, shows several automotive installations of the Exact Weight "Shadowgraph."*

Cincinnati Shaper Co., Cincinnati, Ohio, has brought out a new 27-page catalog No. N-1 covering its line of power rapid traverse, universal, utility and high-speed **shapers.***

Various kinds of **industrial safety clothing** are described in a catalog published by the Industrial Gloves Co., Danville, Ill.*

Bulletin No. 51 issued by the Hannifin Mfg. Co., Chicago, describes in detail the new Hannifin No. 10 **tool room machine.***

A 12-page booklet issued by Carboloy Co., Inc., Detroit manufacturers of cemented carbide tools and dies, describes how Warner & Swasey Co., Cleveland, applied **Carboloy** general-purpose too's throughout its plant on approximat ly 1500 operations.*

*Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.